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THE HUMAN HABITAT

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of civilization

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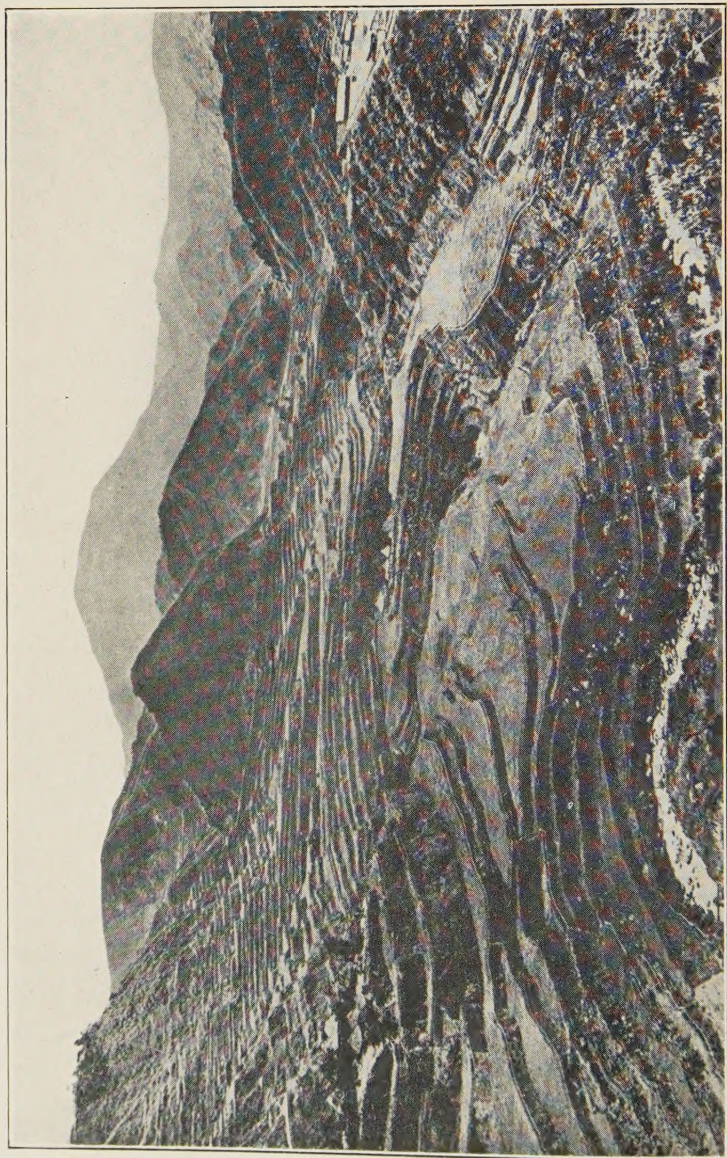
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RICE TERRACES AT BENAUL IN THE PHILIPPINES.

A region where the climate, the soil, and the mode of agriculture combine to permit a maximum use of the land.
(Courtesy Press Illustrating Service, Inc.)

THE HUMAN HABITAT

BY

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THIRD PRINTING



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PREFACE

IN any field of study where knowledge increases rapidly, it is advisable to take account of stock now and then, and see what it all means from the standpoint of the average man as well as the specialist. The growth of human geography has been especially vigorous during the last few decades. As is natural and wholesome under such conditions, several "schools" have arisen. The German school, exemplified by Rätzels, stresses the importance of space relations; the French school, in which Vidal La Blache holds high rank, is notable for broad generalizations and fine local descriptions; the English school centers around the natural regions of Herbertson. The American school, youngest of all, adds to these points of view four others which figure less prominently elsewhere: namely, land utilization, the changing quality not only of human culture but of man's physical environment, the indirect action of geographic environment especially through the process of selection, and the effect of geographic environment upon health.

The utilization of the land is a fundamental theme in all geography, but in America it assumes new significance. This is the natural result of the newness of the country, for that enables us to see all stages of the process in actual operation. A true understanding of the problem has been greatly facilitated by the uniform statistics which the United States and Canada provide for an enormous area comprising almost every type of geographic environment.

Geographers have long recognized that primitive man cannot respond to his physical environment in the same way as civilized man. They have also recognized that the environment changes by reason of natural fluctuations such as flood and drought and by reason of human actions such as the depletion of the soil, the felling of forests, and the construction of artificial lakes and canals. Nevertheless, it has remained for American workers to carry these ideas to their logical conclusion. Mr. C. S. Gilfillan, for example, has compelled us to note how man's increasing ability to overcome cold weather has caused a movement of civilization into cooler climates; Miss Ellen C. Semple has stressed other phases of the problem; and others have shown how fluctuations of climate have caused the coldward movement to waver.

One of the most distinctive features of the American school of geography is its recognition that the indirect effects of physical environment are at least as potent as the direct effects, and probably more so. The indirect effects are especially potent when they arise through natural selection. Physical environment never compels man to do anything; the compulsion lies in his own nature. But the environment does say that some courses of conduct are permissible and others impossible. In any given environment nature exterminates people who try to live by means of certain occupations, or who practice certain habits, or who have certain types of physique. She may do this very slowly, but she does it so effectively that in the long run, unless fresh migrations occur, each region comes to be characterized only by occupations, habits and types of people that are adapted to it. This process of selection is the key to a large part of the science of geography.

Another distinctive feature of American geography is its recognition of the importance of health and energy as primary factors in determining the rate of human progress. The geo-

graphical distribution of health and its relation to environment have been statistically studied in the United States much more than elsewhere. In this respect, as in others, one of the most characteristic features of American geography is its use of statistics. A book like Vidal La Blache's fascinating and brilliant *Human Geography* has practically no conscious statistical basis. Work like that of Dr. O. E. Baker on the utilization of the land displays the use of statistics in a way that illuminates geography most wonderfully.

The present book is an attempt to give the layman a true idea of human geography as interpreted by the American school of geographers. It does not pretend to present the proof of the many conclusions which it sets forth, for that has been done in hundreds of books and articles by scores of authors. Nor does it pretend to cover the whole field. It simply selects certain main phases of the subject as illustrations and sets them forth quite fully. This method makes it necessary to omit many highly important phases of geography. The original outline included chapters on cities, commerce, minerals and other topics which have been wholly omitted or greatly abbreviated. This has seemed advisable because the layman is far more likely to find profit in a full and interesting discussion of a few of the greatest topics than in the brief and perhaps dry discussions usually found in books which include everything.

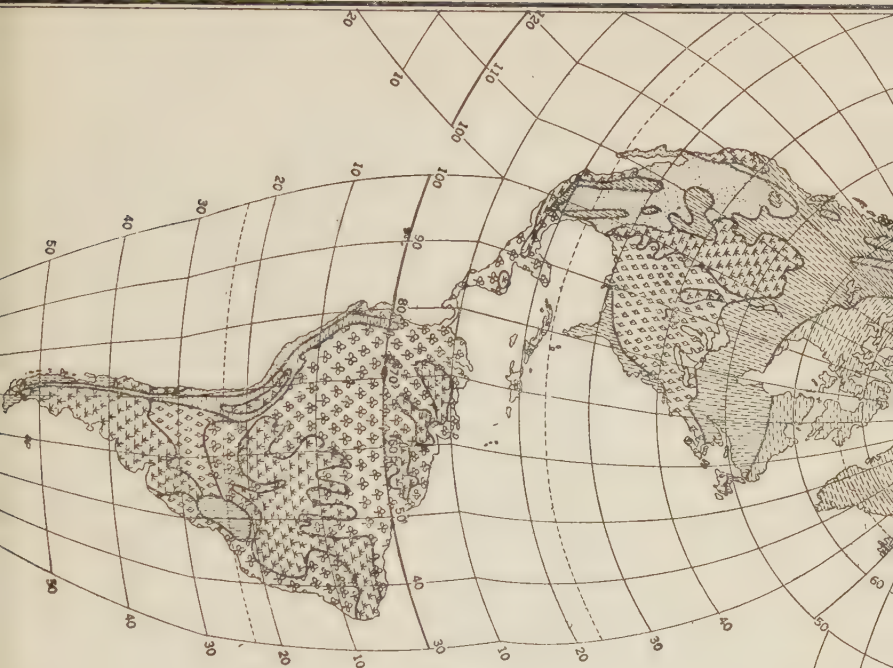
In preparing this book the author has been indirectly helped by hundreds of people, but the direct helpers have been almost limited to those universal standbys, wife, secretary, library, government and editors. Mrs. Huntington is responsible for no end of ideas arising out of talks at the table and the like. Miss Helen L. Harrell has not only copied and recopied many extremely illegible chapters without a sigh until they came around the fifth time, but has been a very keen and eager

critic. Changes suggested by her dot almost every page; they have often been of considerable importance. The Yale Library is one of those wise and patient institutions that rarely get proper credit. The bored air of condescending forbearance with which the attendants ascertain your wants and then show you what you already know in some of the big city libraries makes one appreciate the alacrity, good humor, patience and skill with which Miss Anne S. Pratt and the other people in the Yale Library answer questions. Even if the questions are not easy, the Library can be relied upon to find out something about almost everything. The United States Department of Agriculture, and especially the Bureau of Farm Economics, is the same sort of institution, unexcelled in the patient and intelligent courtesy with which it answers all questions and generally gives one something new and valuable. As for editors, those in charge of the present series suggested the title of this book and have made other admirable suggestions which are embodied herein. Others of equal value could not be used because this book, like many another, kept changing as it grew.

Aside from these the only other person to whom direct thanks are due is Professor Ivy F. Lewis of the University of Virginia. He pointed out to the author the contrast between Buckingham and Albemarle counties in Virginia and provided much of the material in the last chapter of this book. An author is indeed fortunate to find such ready and effective help wherever he turns.

ELLSWORTH HUNTINGTON.

NEW HAVEN, CONN.
October, 1927.

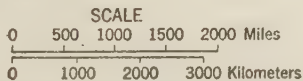


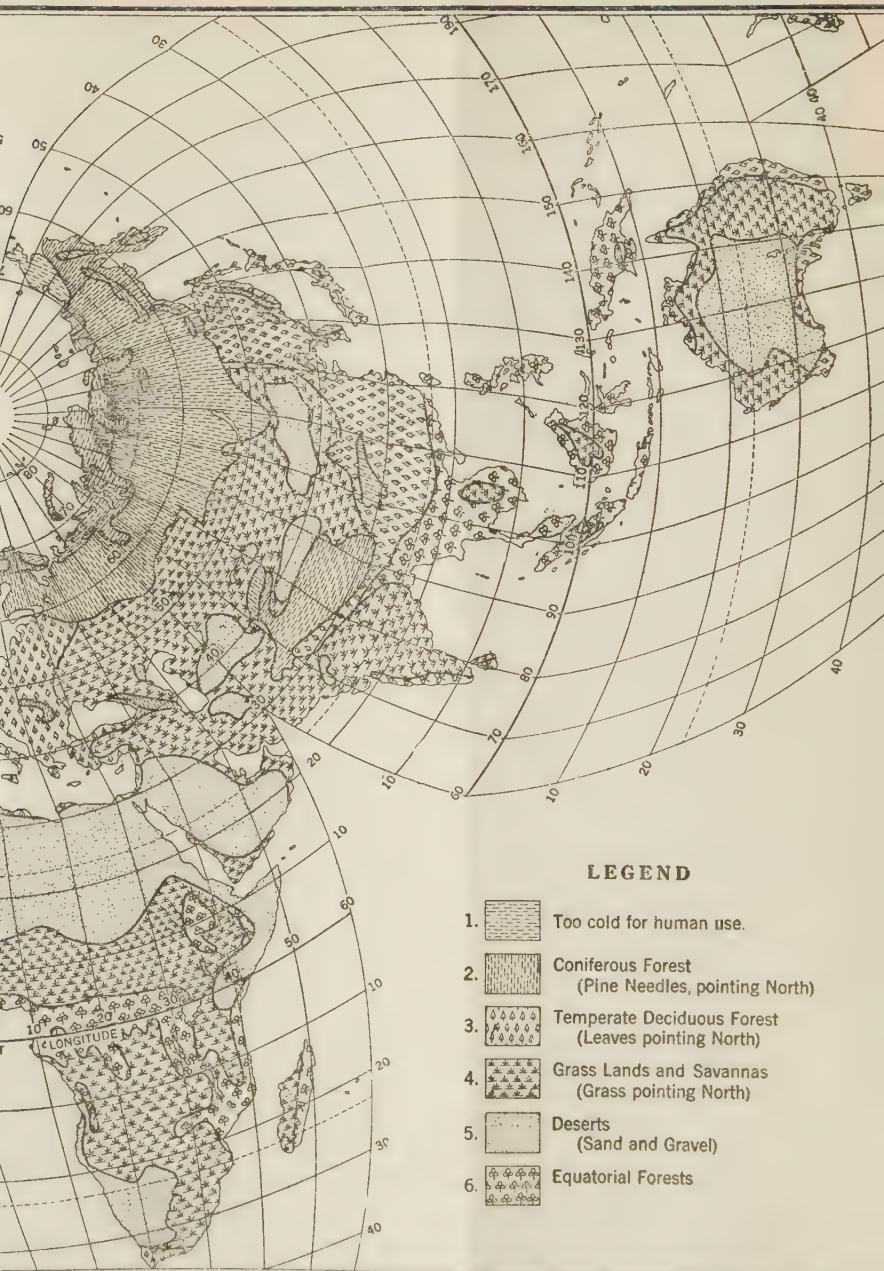
THE EARTH'S GARMENT OF VEGETATION

J. Paul Goode's Polar, Equal Area Projection from
the Goode Series of Base Maps. Reprinted by
Permission of the University of Chicago Press







Note: This new projection has the following advantages compared with other maps of the whole world:

1. Each continental lobe is given a mid meridian of its own, thus assuring the best possible shape for the continent.
2. All parallels of latitude are arcs of circles, concentric from the north pole.
3. Every point in the map is shown at its true distance from the north pole.
4. Distances are true on all mid meridians, and on all parallels of latitude.
5. It is strictly an equal area projection.
6. It shows space relations across the north pole as well as across the equator.





LEGEND

1.  Too cold for human use.
2.  Coniferous Forest
(Pine Needles, pointing North)
3.  Temperate Deciduous Forest
(Leaves pointing North)
4.  Grass Lands and Savannas
(Grass pointing North)
5.  Deserts
(Sand and Gravel)
6.  Equatorial Forests

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THE HUMAN HABITAT

CHAPTER I

THE TERRESTRIAL CANVAS

THE surface of the earth may be likened to a huge canvas upon which a great artist paints with many colors. The resultant picture embodies all the facts of geography, including human geography with which this book is concerned. The foundation of the artist's color-scheme is the contrast between land and sea. A few hundred thousand people may be able to live in boats upon the surface of the sea in the quiet Chinese waters of the West River at Canton, or at the station where oil is trans-shipped to river steamers off the mouth of the Volga. As time goes on, more and more people will doubtless float on shallow and protected coastal waters and cultivate oysters, clams, lobsters and many other types of sea food as assiduously as they now cultivate the lands. But that will almost inevitably be limited to a very narrow area closely fringing the coast. On the main sea itself, it is not likely that people will ever live permanently, except as they are engaged in transportation, or in fishing to supply food for their fellow men on the land. So, on the artist's canvas, the great foundation pigments of land and sea will stand through the milleniums as the most permanent and noteworthy of all the features in the great picture of human geography.

Having laid the foundations of the picture, the artist turns to other types of color which can be washed over the enduring tints of land and sea without effacing them. His second set of

colors is furnished by climate. With these, around each pole, he paints broad disks of uninhabitable territory sheathed with bluish-white ice and snow in Greenland and Antarctica, or sparsely covered with the grassy, mossy, brownish-green vegetation of the tundras. Next comes a belt of cold country with long snowy winters and moist summers plentifully supplied with rain. It is too cool for agriculture, but well adapted to dark-green coniferous forests which dominate the landscape far and wide. Another sweep of the brush, and the artist has painted what we may call the band of cyclonic storms — the best part of the world from the standpoint of human progress. It includes southern Canada, the northern United States, and the most progressive parts of Europe. It swings on into Russia, is almost lost in Siberia, but revives in Japan. Here cyclonic storms bring rain at all seasons; conifers still persist, but broad-leaved deciduous trees obtain the mastery; the summers are long enough for agriculture; the winters are not long enough to be seriously depressing; and the climate is highly invigorating.

As the painter reaches middle latitudes and passes on to warmer regions, he seems inclined to make a separation between the green lands of the cyclonic belt and those lying near the equator. So he begins to paint a band of yellowish and reddish deserts. Starting at the west coast of each continent in latitudes 20° to 35° , he gives a stroke from west to east. Except in North Africa, however, he lifts his hand before the eastern coast is reached. Then dipping his brush in a new color, he completes his eastward stroke with a band of heavy summer rains which bring luxuriant vegetation, as appears in what may best be called the monsoon regions of China, the southeastern United States, and the east coast of central Australia.

Green is the painter's favorite color. So once more, around

the center of the earth and extending fifteen or twenty degrees on either side, he paints a band of permanent verdure. It is grassy on the outer borders, away from the equator, but soon passes into genuine savannah stippled with trees. Then comes the belt where the green is deepest — the great tropical jungle and equatorial forest.

One of the most interesting features of the climatic colors is the way in which they change from season to season. The polar caps, to be sure, retain almost the same bluish-white tint from January to July. They merely expand, as it were, until the northern cap covers all the lands half way to the equator. The tundra belt looks like part of the polar cap much of the year, but in the late spring it loses its cover of snow and turns to a brownish hue; then the brown becomes shot through with green, some parts are genuinely verdant, and brilliant flowers display a fleeting glory. But the greenness is short-lived as well as imperfect; early in the fall it begins to turn brown, but is covered with snow almost immediately. In summer, the great belt of conifers displays almost no tints except the dark colors of its pines, spruces, larches and other bearers of cones. In winter, the dark tints are relieved by patches of white snow, while in the spring the whole forest is brightened a little by the fresh green of young shoots. Yet the general effect is always somber.

Along the line of transition between the coniferous and cyclonic zones, the artist has interlaced the deepest somberness with the greatest play of colors. In summer, in the portions of middle latitudes where cyclonic storms prevail, broad-leaved trees combine with conifers and grasses to display almost every shade of green. In the autumn, the broad-leaved deciduous trees and bushes flame into red, yellow, purple and brown. Then a veil of brown and gray is spread over the land, but through the veil reddish patches of oak leaves and dark green

patches of conifers seem to strive to preserve some color as long as possible. When winter comes, this variegated zone discloses a snowy background as white as the great ice-caps, save where it is shadowed by the gray lace of bare branches, or by the dark yet comforting foliage of the conifers. Then spring arrives once more, the patches of melting snow disappear, and the brownness of the landscape is more noteworthy than ever. But soon the tender green of young grass is interspersed with infinitely varied shades of red, yellow, purple and brown, wherewith the budding trees delicately forecast the brilliant colors which they will don in the final climax of autumn. Where the change of color is greatest, there the conditions for human progress are most favorable.

The deserts confirm this last statement, for in their uninhabitable reddish or yellowish centers, they show no change from year's end to year's end. On their borders, however, and in the grassy steppe lands round about where the population is now merely sparse but where ancient civilizations once flourished, there is an annual change from brown or yellow to green and back again. The green may be a mere flush lasting but a few weeks, or a deep mantle lasting two or three months. This in itself is no more noteworthy than the change from brown to green anywhere else, but many deserts display another flash of color which is almost unique. Other regions do indeed have brilliant flowers at certain seasons, but nowhere else is the ground so brilliantly and completely carpeted with a marvellous pattern of gorgeous and highly varied flowers. Yet even so, in variability of coloring, the desert borders rank only a poor second to the belt of cyclonic storms.

East of the deserts the changes of color in the deciduous woodlands of the monsoon type are only a feeble imitation of those in the cyclonic woodlands. Snow may whiten the landscape in winter, but not for long, and not everywhere at the

same time; the landscape may tend to be brown in the autumn and in the winter when there is no snow, but the brownness is broken by great numbers of trees and other plants that remain green all the year. In the same way, the spring may see lovely tints of pale green and even of red and yellow, together with flowering trees and shrubs which are even brighter than those of the cyclonic belt, but the general display of tender colors is nothing like so varied and prolonged. In summer, to be sure, the greenness is about like that of the other deciduous belt, but the dull browns and yellows of autumn are only a faint reminder of the gorgeous colors farther north where frost arrives while the leaves are still vigorous. Yet this belt — this incomplete stroke of the artist's brush, stands third in the variety of its colors.

Farther toward the equator, the savannah belt is either green in the wet season, or brown in the dry season, with green spots where clumps of trees still hold their foliage. Then comes the broad band of equatorial jungle and forest, where the only change is from a slightly brighter to a slightly darker shade of green. At some seasons the greenness is broken here and there by the bare branches of trees that have shed their leaves, by the tender reddish young foliage which replaces that which is a year or so old, or by gorgeous flowers which sometimes deck even the barest trees with marvellous patches of red, yellow, purple, orange or blue. Yet the prevailing effect is unmistakably green at all seasons. The colors in the tropical belt are not so monotonous as those of the ice-caps and the centers of the deserts, but they are monotonous enough to be depressing.

As it is with the changes of color from season to season, so it is with the changes from one climatic cycle to another. In the polar regions the coming of glacial and interglacial epochs makes relatively little difference. Even if the ice-caps dis-

appear during inter-glacial epochs, snow still covers the ground most of the time, while the coming of a glacial epoch merely means that the present conditions are a little more extreme. But in the cyclonic belt, in such places as the northern United States, southern Canada, and northwestern Europe, the coming of glaciation means a change from conditions at least as mild as those of today to the severity of an ice sheet as vast as that which now shrouds Antarctica. It means all the difference between the best that the world now knows from the standpoint of human health and activity, and conditions so severe that aside, perhaps, from certain lowly bacteria, no life can possibly survive. The centers of the great deserts likewise change only a little with the coming of glacial epochs. The amount of moisture does indeed increase somewhat, but not enough to prevent them from still being very dry. In broad strips on the desert borders, however, and in the smaller, less arid deserts, the change is vast. It means the difference between supplies of moisture so abundant that vegetation can thrive for a long season each year, and supplies so scanty and variable that in many years the grass makes almost no growth. Farther toward the equator the change from a glacial to an interglacial epoch once more becomes insignificant. The warm moist regions of the earth appear to remain relatively warm and moist no matter what happens elsewhere.

As it was with the great changes of glacial periods, so it has been with the similar but smaller climatic pulsations during the course of history. Whether we deal with the seasons of a single year or with great climatic cycles of tens of thousands of years, the principle is the same. Where the artist has painted the climatic colors most firmly and unchangeably, there civilization is low; where he has painted them in such a way that they shimmer and change, glow brightly and then fade, there civilization rises highest. The civilizations of today are located

where the changes are greatest of all; the civilizations of the past were located where the changes rank next in variety.

Having sketched his main background by means of the unchanging lands and seas and the varying tints of climate and season, the artist turns his attention to a wholly different set of colors, those depicting the heights and depths of the lands, and the waters that flow upon the surface. The greater features of the relief of the lands take the form of great plains, mountains and plateaus. They are painted in shades almost as bold and sweeping as those of climate, but the minor features, such as valleys, streams, and the minuter hills and hollows, are so small that their infinite details can be included only with the greatest difficulty. The plains and lowlands are by far the most important features in this phase of the picture. Not only are they the most extensive parts of the earth's surface, but they are the places where plants, animals, and especially people, thrive in greatest abundance. So the lowland color is brushed over vast areas, but always in such a way that it never obscures the main climatic pattern. It assumes a sort of symmetry from continent to continent, with the main lowlands on the side toward the narrower ocean, which is the Arctic in Europe and Asia, the Atlantic in the two Americas and Africa, and the Indian Ocean in Australia. Mountain systems may partially separate the main plains from the narrower oceans, but they are small compared with the huge ranges and vast plateaus which rear themselves on the side toward the broader oceans.

The mountain systems and plateaus have their own special tints on the great terrestrial canvas, but these tints are so mixed with those due to climate that the two sets are almost inextricable. At the equator the colors indicating relief are mixed with climatic colors ranging through all the zones from the belt of tropical verdure to that of polar ice. Nevertheless, on the mountains, as on the continents, there are certain dis-

tinct limitations as to what colors shall be used. Just as the painter fails to make a complete band of desert clear across each mass of land, so he fails to paint deserts on all sides of a mountain range, unless perchance the mountains happen to rise from the very midst of a desert. On many mountain ranges, as on the continents, one side is dry, the other moist.

Rarely or never is it the habit of the artist to paint a single mountain range standing alone. His favorite scheme is to make the mountains serve as buttresses to broad plateaus. Each of these great up-archings of the lands is usually bordered by two or three parallel ridges on each side, like waves breaking from either direction against a central mass. Ordinarily each set of waves numbers two or three, increasing in height toward the interior of the plateau. Thus in California we have first the Coast Range, then the much higher Sierra Nevadas, and next the broad plateau which extends as far as the Rocky Mountains. There another series of parallel ranges raises itself before the land plunges off steeply to the east. In Asia it is the same way. The little Siwalik Range lies at the foot of the Himalayas; the Himalayas themselves comprise no less than three parallel ranges, culminating in the great trans-Himalaya. Then comes the huge plateau of Tibet, and beyond that the ranges of Kuen Lun and Altyn Tagh.

Now for a finer brush with which to depict the minor details of topography — the almost invisible swell of the prairie, the little hills and hollows of the lowland, the irregular pits and ridges of glacial moraines, the deeper, bolder valleys of the highlands, and the crags, cliffs and peaks of the lofty mountains. The finest brush of all is needed to trace the marvellous network of the waters — the lakes and ponds, the rivers, brooks and rivulets all over the broad lands.

The combination of oceans and lands, climate and relief, and waters on the face of the lands, assuredly gives sufficient

complexity, but there are still other ways of varying the landscape. One way is through the character of the soil. As soon as the brush is lifted for this purpose it becomes evident that three chief ingredients must be used in mixing the colors. The first depends upon the character of the underlying rocks, the second upon the relief of the land, and the third upon climate. Where the rocks are composed of quartzite or quartzose granites, the soil necessarily contains a large percentage of quartz grains and is correspondingly sandy and infertile. Where the rock consists of basic igneous rocks, and especially of fresh, dark, volcanic, eruptive materials, the presence of abundant iron, lime, magnesia, potassium, and sodium assures the presence of a highly fertile soil, provided the climate and relief do not spoil it.

Most of the soils of the earth do not overlie the rocks from which they were originally formed; they have been transported anywhere from a few feet to a few thousand miles, and have been mixed with other soils. If they lie where the slopes are steep, only the coarse materials are likely to remain, but on the gentler slopes the transported soils become more and more fine-grained until the finest clays prevail. Such soils, in regions like the Mississippi flood plain, or the still greater plains along the Chinese rivers, are sure to have been derived from such diverse sources that they contain all the necessary ingredients for the growth of vegetation. They are often water-logged, to be sure, so that the air does not get a chance to penetrate them, and the right kind of decay does not take place, but man can often remedy such defects. Some of the best soils are those which lie in the older parts of alluvial flood plains, near the rivers perhaps, but high enough above the water courses so that they are not water-logged and the air can penetrate them freely. Even the minor differences in elevation or slope often make an enormous difference in the chemical quality of the soil, as well

as in its texture. For that reason, almost no other factor of geographical environment, unless it be relief itself, gives rise to such marked local differences in vegetation and in human life.

In discussing these minute differences in the soil which arise by reason of the underlying rocks and the topography, we have overlooked certain broad general differences which follow the climatic pattern. Where the climate is very cold, and in large parts of the huge areas where glaciation occurred during recent geological times, the soil is poor because it is too fresh; it may be broken into fine grains by frost or by the grinding power of moving ice, but decomposition is slow. There is, to be sure, plenty of moisture, but in the colder areas the low temperature causes the vegetation to be so scanty and to decay so slowly that the ground water is almost pure. It does not contain much carbonic acid and other products of vegetable decay. Yet these are of the utmost importance in breaking up the soil, and in freeing the chemical constituents which are needed by the plants. In addition to all this, weathering can take place only a few months each year, because the soil is frozen the rest of the time. When melting occurs, the water in the soil is practically always so abundant that the process of leaching takes place rapidly and whatever materials have been converted into the soluble forms which alone are available for plants, tend to be carried away.

As we leave the coldest regions and proceed toward lower latitudes, the soil gradually improves. In the areas of the pine forests, for example, the constant falling of the needle-shaped leaves provides a certain amount of humus, for the leaves decay so slowly that they become a part of the soil. That gives a supply of nitrates and other materials which help to make the soil good for crops. It also provides acids and bases which help toward the decomposition of further soil. Nevertheless, the cold

winters check the decay of the rocks for such long periods and the abundant water leaches away the soluble materials so rapidly that the soils are only moderately good. Moreover, the processes of soil formation in cool regions are so slow that in large parts of Canada and Scandinavia where glaciation occurred recently, there has not yet been time to produce more than the most scanty results.

Even among the deciduous forests of somewhat lower latitudes, similar conditions prevail, although not to so great a degree. Thus the deficiencies just described are more or less in evidence in practically all of Canada, except the southern prairie portion which lies westward and northwestward from Winnipeg to the Rocky Mountains. The same is true in the northern United States from northeastern Minnesota and Wisconsin eastward through Michigan to New York and New England, and in most of northern and central Europe as far south as the Alps and the northern borders of the Black Earth region of Russia. Siberia, too, suffers severely from the fact that slow weathering and rapid leaching give rise to millions of square miles of poor, infertile soil.

The best soils of the world's forested regions, provided we ignore for the moment the local differences due to the character of the rocks, are found in the broad-leaved forests of a central zone in middle latitudes including regions like Virginia, Kentucky, Tennessee, and central France. Farther toward the equator, the soils again deteriorate. The increasing length of the warm period not merely stimulates the growth of vegetation and thereby imposes a greater drain upon the soil, but causes the vegetation to decay very rapidly. In the warmest, moistest regions, this decay takes place so speedily that practically none of the vegetable material remains in the soil, and no fertilizing humus is added. At the same time, rapid decay provides abundant chemicals for the soil water so that particles

of rock are rapidly decomposed. Then the abundant rains leach out the plant food. Since these processes go on at all seasons, the soils become very poor indeed. The red material known as tropical laterite is one of the poorest soils in the world. It does indeed support abundant tropical vegetation, but for the majority of crops it is almost as poor as ordinary sand.

The best of the world's soils have remained almost unused until our own day. Some of them are found in the grassy plains of middle latitudes, but the best of all occur in deserts. In very dry regions the scarcity of water retards the decomposition of the soil and in that respect limits the supply of plant food. Nevertheless, when moisture is present, as it is from time to time, the temperature is often high enough so that the rocks are decomposed rapidly. But even if soluble products are thus formed in large amounts, they are not easily removed. In the first place, there is little vegetation to rob the soil of its wealth, and convert it into forms which can be dissipated through bacterial decay. In the second place, what little vegetation there is does not decay so rapidly or completely as in warm moist regions, and some of it remains to improve the soil. The most decisive feature, however, is that there is not rain enough to leach the soil. When the infrequent rains come, they do indeed dissolve some of the soluble materials, but the water thus enriched generally evaporates close to where it fell. Therefore the soil is not robbed of its plant food and the desert soils grow richer and richer. That is why the irrigated lands in the United States produce crops worth from 25 to 65 per cent more per acre than do the other soils. The best soils of all the world today are probably found in the vast desert areas, including both the yellowish or grayish border zones and the huge tracts of very fine-grained, reddish sand which form the central parts of the world's greatest deserts. If water could

be led to them, it seems as if the world's food supply might easily be doubled or trebled.

Between the deserts and the forested areas in middle latitudes lie highly favored grasslands whose soils partake more or less of the desert quality. If they happen to be plains, as in the prairies of the United States and Argentine and the Black Earth region of Russia, the combined effect of relief, climate, and vegetation makes them almost as good as the desert soils so far as undissolved plant foods are concerned. The rains in such regions are not so abundant as in the forested regions, or at least they are not so evenly distributed through the year, which is the main reason why the vegetation consists of grass instead of forests. The grassy vegetation dies down each year and forms abundant humus, but does not completely decay before it becomes part of the soil. The gentle topography prevents the water from running off with great rapidity, but yet allows it to drain away so that the air has a chance to aerate the soil. The result is the production of black or dark soils which have been relatively little leached, and are full of nitrates, lime, potash, and phosphates, which are the main necessities for plants aside from water and the oxygen and carbon dioxide found in the air. Such soils may not be quite so rich as those of deserts, but they more than compensate for this by occurring in places where there is enough rain for agriculture. Therefore such regions as the prairie plains of the United States and Argentina, and the Black Earth region of southern Russia are among the best parts of the earth from the point of view of agriculture.

Thus we see that in the great canvas depicting the earth as the home of man, the painter adds to his other colors the poor soils of cold regions, then better and better soils in the well-watered forested areas until the region of broad-leaved forests is reached in central latitudes. Then the soils deteri-

orate until the red equatorial laterites are about as poor as can be found anywhere. In both polar and equatorial regions the climate tends to produce poor soils all the way around the earth. In middle latitudes, however, there is a pronounced change as one goes from east to west. On the east side of each main land mass, in approximately thirty to forty degrees of latitude, or as far north as the borders of the ancient ice sheets, one finds in the broad-leaved forest areas the best of the humus types formed in the forest. Farther west, and at slightly higher latitudes, come the extremely fertile black prairie soils. The best of all soils, on an average, are found still nearer to the western side of each land mass, in the deserts which mainly lie in latitudes twenty to forty degrees.

This broad climatic generalization — these sweeping strokes of the artist's brush — must not make us forget that the soil preëminently lends itself to local variations. A spot of fertility is found in almost any climate where fresh volcanic ash of a basaltic nature occurs; a spot of barrenness, almost a desert, occurs in even the best of climates, where coarse, well-washed gravel or a soil made of pure quartzite prevails.

The final stage in our geographical picture, although it happens to be an early stage geologically, is the segregation of minerals. The metals occur in tiny areas here and there, especially among the drier mountains. Coal is found in great sheets, chiefly in middle latitudes but with a good deal in high latitudes. That which occurs in latitudes below forty degrees is not only scanty, but mostly of poor quality. Petroleum seems to have no definite rules of occurrence, although the greatest supplies thus far have been found mainly in latitudes not much higher than forty degrees or lower than fifteen. Useful stones such as limestone, granite and slate, together with materials like brick clay, sand and gravel, are more widely distributed than any other usable minerals. But all minerals

are alike in one respect; they are not limited to any one zone of climate, they may occur under widely diverse kinds of relief, and they take the form of small isolated and often highly vivid spots which almost blot out all the other colors upon the great canvas of human geography.

We have traced the way in which one color after another is brushed into the picture of human geography, but have not yet brought man into the scene. We have proceeded from the larger to the smaller features, from those which determine the broadest aspects of the distribution of man and his habits to those which determine the minor and more local aspects. The most basic colors are those which portray the contrast between land and sea, but those of climate are the ones that most demand study. This is not merely because they form the largest, most uninterrupted areas, the fundamental outlines of the picture aside from those of land and sea. It is also because climate is the most variable of all the factors of geographical environment. It varies from place to place, from season to season, from year to year, and from one decade, century or millennium to another. It is always varying.

But climate does far more than this. As cause or effect, it enters intimately into the colors representing the soil and the relief of the earth's surface. It is one of the main agents in determining the quality of the soil; a large share of the effect of the relief of the earth's surface is due to differences in temperature and rainfall which the altitude and form of the lands themselves engender. Another reason for the overwhelming importance of climate is that it alone among the great inanimate features of human environment produces direct physiological effects upon mankind as well as indirect effects of other kinds. The direct effects include not only those of storms, tornadoes, fogs, high winds, floods, snow and all the external helps and hindrances due to any and every kind of weather,

but the internal effect of the weather in making people feel energetic at some times and in some regions, and inert at other times and in other regions. The greatest of the indirect effects arise through plants and animals. Practically no soil is so poor or thin, no cliff so steep, that it will not support some vegetation if the climate is right; and wherever there is vegetation, some form of animal life is found. But no soil, however rich and deep, and no relief, however gentle, will cause vegetation to grow on an ice sheet, or in an utterly waterless desert. Another indirect effect of climate arises through bacterial diseases. Some of these flourish in one climate and some in another. Certain climates such as those of the coldest ice sheets, are largely free from bacteria, whereas the warmest, moistest climates are full of highly deadly types. Thus through its direct effects, especially, upon man's movements and energy, and through its indirect effects on soil, vegetation and animals, and on man's occupations, food, clothing, shelter, health and tools, climate becomes the most potent of all purely physical influences in determining what kinds of human activities and habits shall prevail in one region or another.

It is not surprising, then, that the climatic colors stand out more prominently than any others when the canvas of human geography is viewed from a distance. Nevertheless as one comes nearer, the climatic colors often grow faint and indistinct. Those which depict the soil, the relief of the lands, the bodies of water, and the minerals, often stand out so clearly that they seem to be of dominant importance. The near view differs so greatly from the more general view that many people have supposed that the two are in conflict. There have been arguments as to whether soil, climate, relief, or position in respect to bodies of water is the most important feature of geographic environment. Such arguments are not necessary; all the elements combine to form a harmonious whole; each color

is important, and each is prominent according to whether we view the picture as a whole or in detail.

Such is the background upon which nature has placed her living beings. For better or worse the decrees of nature insist on a close adjustment between life and its inorganic environment. That is why plants are universally recognized as one of the best evidences of the conditions of climate, relief and soil. A given kind of plant may indeed migrate over large parts of the earth's surface, but if it migrates from one type of climate to another, or one type of soil to another, it is almost certain to change its characteristics. Animals, in turn, depend very closely upon the type of vegetation, as well as upon the more direct effects of the environment. Running animals, like the antelope, are not at all adapted to wet, marshy regions or river beds such as the hippopotamus enjoys. The water buffalo, with its almost hairless skin and its fondness for submerging itself in mud and water, and the musk ox with its thick coat of wool and hair, would promptly die if their habitats were interchanged. Animals, far more than plants, may migrate from region to region, but unless some change occurs in them through mutation or through the processes of natural selection, they cannot go beyond certain definite limits imposed by climate, soil, relief and the resultant types of vegetation. The same is true of man, except that he is less limited than animals, just as animals are less limited than plants. Yet even man is limited. Let any type of human beings be divided into groups which live for some generations in diverse geographic environments, and the groups will tend to diverge in such fashion as to become adapted to the various environments, and to the occupations which are profitable in those environments. Conversely, if we find any peculiar condition of human physique, activity or character localized in a special place, the chances are that the physical environment has had something to do with its pres-

ence. It is conceivable, to be sure, that the present geographic environment may have little or nothing to do with the matter, but the more carefully the history of any human condition is traced, the more probable it becomes that its localization in some special part of the earth is due in considerable measure to the complex and often indirect influence of many geographical conditions, acting partly at present but still more in the past.

CHAPTER II

WHERE PEOPLE DWELL

THE central theme of geography is the distribution of man, and of his activities, habits and characteristics, in relation to the environment described in the preceding chapter. The first step in understanding the matter is to comprehend why people are numerous in some places and scarce in others. Consider how enormously the density of population varies from place to place. Massachusetts and Rhode Island are almost a thousand times as thickly populated as Nevada, and about thirty thousand times as thickly as the Yukon territory of Canada. England and Belgium have seven hundred people per square mile, but Iceland only two. The Nile Valley, with eleven hundred people for every square mile, touches the Egyptian desert where there is scarcely one person in three thousand times as much territory.

Why do such differences occur? It is easy to answer that Nevada and the Egyptian desert are dry, while the Yukon territory and Iceland are cold. But how about New Guinea? That East Indian island lies almost next door to Java and has a similar equatorial climate with abundant rain, but New Guinea has only three people for every square mile while Java has seven hundred.

Consider the matter from your own personal standpoint. Are you one of a hundred thousand people packed into the apartment houses of a single square mile in a city? Do you live in a suburb where there are about a thousand people for every square mile? Or do you live in some remote place where

the average family is separated from its neighbors by two or three miles? Whatever may be the density of the population, it obviously has an almost incalculable effect upon you. The person in a huge apartment house in a city, the dweller in the suburbs, and the one who lives miles from neighbors cannot possibly live the same life, or think the same thoughts. They are likely to differ radically in the amount that they travel, the food they eat, the clothes they wear, the kind of houses they live in, the means of transportation they employ, the recreations they enjoy, the kind and amount of schooling that they get, the degree of choice that they have in finding husbands or wives, and a hundred other things. Try to picture your own life if the region around you should suddenly become a hundred times as populous as now, or if ninety-nine out of every hundred people should move away.

Each stage of civilization has its own special conditions as to the distribution of population. In the lowest stages the people are always sparsely scattered. In a somewhat higher stage they are not so thinly scattered, and begin to have villages. Then comes a stage where the population is fairly dense, but the towns are still relatively insignificant. Finally, whenever civilization rises to high levels, the population tends to be concentrated in cities. This may be dangerous, because cities are the destroyers as well as the upbuilders of civilization, but it has happened again and again.

One of the most fundamental facts about the distribution of population, and one which many people fail to realize, is that by far the larger part of the earth's surface supports about as many people as it can under the prevailing types of culture and standards of living. Even in a relatively new land like the United States, the population cannot long increase at the present rate unless we devise new methods of obtaining food and raw materials, or adopt lower standards of living. As a matter of



PLATE I. SIBERIAN NATIVES IN THE SNOW ON NORTHEAST COAST OF SIBERIA.

In a region so cold, as this section of Siberia is a metropolis. The most inhabited place may be a hundred miles away.
(Courtesy American Museum of Natural History.)



PLATE II. UROLOMUM NATIVES OF NEW GUINEA INSIDE A HUT OF BRUSSELS.

This illustrates the low stage of culture in tropical regions where poor soil and a warm, wet climate combine with other depressing factors. (Courtesy Asia Magazine.)

fact, both things are actually happening. Parallel with our many inventions and discoveries, there has been for two or three generations a growing tendency for the great masses of the poorer people who swarm in the factory cities to adopt a standard of living lower than that of corresponding people at an earlier date. One example of this is the reduction in the average consumption of meat. In 1907, according to Mr. John Roberts of the United States Department of Agriculture, we consumed an average of 159 pounds of meat per person, in 1926 only 143 pounds. During the six years from 1907 to 1912 the consumption was 149 pounds, during the six from 1921 to 1926 only 143. The use of expensive beef has declined still more, from 71 pounds in the first period to 61 in the second, but the use of cheap pork has risen from 64 pounds to 69. The change in the use of meat is often supposed to represent a swing toward a more healthful vegetarian diet, but the main reason for it is that the human population is increasing faster than the domestic animals. Hence the price of meat has risen with special rapidity and the poorer people are compelled to eat less meat and poorer kinds than formerly. In this respect at least, the standard of living has fallen. The country as a whole may be growing richer, but in the long run there is a decided tendency toward the growth of large groups of laboring people, miners and farmers, whose standards of living average lower than did those of the same classes a few generations ago. It seems to be almost inevitable that ultimately there should come to us, as to others, a time when the population increases faster than the means of subsistence.

Another point which few people fully appreciate is that at every stage of human culture, and in every type of geographical environment, a certain definite density of population represents the "optimum," or most favorable condition. Take, for example, pastoral nomads like the Hottentots, Arabs, or Buriats

of Siberia. Suppose that there is only one family for every hundred square miles, although there is grass enough to support flocks and herds for several times as many. On an average each group of five or ten families will be twenty to forty miles from neighbors. If the animals wander, what chance has a man to find help or hospitality? If an enemy should penetrate so far, who will assist the tents which are raided? Since large areas are not needed for the flocks and herds, wild beasts will multiply, and the young of the domestic animals will be in constant danger. If the population increases tenfold, on the contrary, there may not be grass enough unless the average herd becomes so small that it will barely support a family. When bad seasons occur such conditions are almost certain to breed distress, strife and war. Somewhere between these two densities lies the optimum—the condition where each man can have a large herd, but where the camps are near enough to be of mutual assistance, yet not near enough to cramp one another's supply of grass in dry seasons.

In our own type of civilization the optimum is equally clear. If the farmers are too far apart they cannot afford to build good roads; they cannot easily market their produce, attend the Grange meetings and church, send their children to school, or get the mail or the doctor. If the farmers are too numerous, they will not have land enough to yield a reasonable living. If people are too closely packed in cities, intense poverty, labor troubles, and other bad social conditions will prevail; the birth rate will fall and the death rate rise so that many of the more valuable types of people will actually die out from generation to generation. The optimum obviously lies somewhere between the sparsely settled farms and the crowded cities.

The area of the earth is estimated at 57,255,000 square miles. Almost exactly half of that vast area has less than one inhabitant per square mile, and probably does not contain

much more than ten million inhabitants. Think what that means — half of all the lands have no more inhabitants than New York and London put together. The ten million people who live in the central parts of those cities, that is, in New York's boroughs of Manhattan, Bronx and Brooklyn, and in the "registration area" of London, occupy only two hundred and fifty square miles; the ten million who live in the sparsely populated half of the world have about 22,500,000 square miles of space, even if we omit the ice sheets of Antarctica and Greenland. Forty thousand persons per square mile against less than half a person! A twelfth of an acre per family against more than seven thousand acres! Is it any wonder that the modes of life and thought are utterly different?

Although many conditions coöperate in causing half of the earth's surface to have less than one inhabitant per square mile, the main reason is climate, as might be expected from our survey of the great picture of human geography. This is evident when the regions of this kind are classified climatically, as in the following table:

APPROXIMATE NUMBER OF SQUARE MILES WITH LESS THAN ONE PERSON
PER SQUARE MILE ¹

<i>Continent</i>	<i>Too Cold for Agriculture</i>				<i>Total</i>
	<i>A. Too Dry for Agriculture</i>	<i>B. Because of high Lat- itude</i>	<i>C. Because of Altitude</i>	<i>D. Too warm and wet</i>	
Asia	3,930,000	2,000,000	1,220,000		7,150,000
North America	600,000	4,640,000	40,000	20,000	5,300,000
Africa	5,000,000		50,000	150,000	5,200,000
Antarctica		5,000,000			5,000,000
South America	470,000	220,000	120,000	2,320,000	3,130,000
Australasia	2,020,000				2,020,000
Europe	80,000	200,000	80,000		360,000
East Indies				240,000	240,000
Total	12,100,000	12,060,000	1,510,000	2,730,000	28,400,000

¹ Based on the *Chambers of Commerce Atlas* (Putnam's). Greenland is included with North America; Iceland with Europe. The distinction between

The regions that are too dry for agriculture comprise more than one-fifth of all the earth's land surface. Each continent except Antarctica contains some such regions, although the European region northwest of the Caspian Sea is very small. Africa alone has two dry areas quite unconnected, one of huge size in the north and east, and the other less than a tenth as large in the south. The areas that are too cold for agriculture are even more extensive, for they include not only high latitudes, like the northern parts of North America and Asia, but high altitudes like those of Tibet. The areas that are too warm and wet are much smaller and naturally lie close to the equator. They are the regions where the so-called equatorial rain-forest flourishes. Asia, surprising as it may seem, has no warm wet area where the population sinks to the very lowest levels, and of course nothing of the kind would be expected in Antarctica and Europe. Even Africa has only a little, whereas the East Indian islands of New Guinea and Borneo have somewhat more. The really great developments of the sparsely populated warm wet tropical regions is found in South America in the vast Amazon Plain. There population rises above one per square mile only along the main rivers. One of the world's major questions is whether the climatic handicaps will ever be overcome so that all these regions, and especially the wet tropics, will become the homes of a moderately dense and really comfortable population.

Contrast these sparsely populated areas with the most densely populated parts of the earth — those where the inhabitants number more than 128 per square mile. The main areas of

regions that are too cold because of high latitude and those that are too cold because of altitude is rather vague, for areas like the Canadian Rockies, the southern Andes, and the Stanovoi Mountains of Asia might go in either group. As a matter of fact all of these are placed among the regions that are cold because of high latitude, but this makes no practical difference so far as the conclusions of this book are concerned.

this kind also occur in distinct types of climate. They are located either in warm, moist regions where sugar and rice are raised, or in temperate lands where cyclonic storms prevail at all seasons. In the rice and sugar lands food is extremely abundant; in the cyclonic lands human energy is at a maximum. The rice and sugar type of country is by far the more populous. In Asia and the Far East it includes much of India except the central highland, western desert and high mountains; it also includes part of the plains of Burma, Siam, and Indo-China, as well as Java, the northern Philippines, most of China except the high mountains and arid interior, the best parts of Chosen, and practically all of Japan. The rice regions support approximately seven hundred million people in about two and a quarter million square miles — one person for every two acres compared with one for every twelve hundred or more in the sparsely settled half of the world. Although Africa and South America contain large areas which are climatically similar to the Far East and India, they have only a few small and scattered spots of dense population. The explanation of this, as we shall see later, seems to lie largely, although not wholly, in the absence of rice.

The type of country where dense population is associated with cyclonic storms and a very high degree of human energy is divided into two main sections. The chief of these lies in western and central Europe, including most of Great Britain, and all the region from the Baltic Sea to northern Portugal and southern Italy. It extends eastward through Poland into Ukraine and also into Rumania and Bulgaria. In North America a similar area extends from southern New England southward to Baltimore and westward along the Great Lakes to Chicago. If we include a few other little scraps of similar type, the total area where a dense population seems to arise by reason of the cyclonic type of climate and the great activity of the

people scarcely amounts to more than 1,650,000 square miles with a population of approximately 370,000,000.

The amazing fact about all this is that even when the rice regions and the cyclonic regions are combined, the total area is only about four million square miles, while the population is one billion, one hundred million. In other words, nearly two-thirds of the people of the earth are crowded into seven per cent of the lands. Evidently mankind is very partial to certain limited kinds of environments.

We have said that climate is the main reason why such vast areas are almost uninhabited, but does not poor soil often produce the same result? That is certainly the case locally, as in some of the sandy, gravelly parts of Maine, but soil, apart from rainfall, temperature, relief, and the like never limits the population of large areas to any such low figure as one person per square mile. The soil of large parts of Germany is very poor, as is that of Czechoslovakia and Denmark; yet a population of more than a hundred per square mile is common. In Denmark, outside the cities of over twenty thousand people, the population numbers more than one hundred and thirty per square mile. Vermont, New Hampshire, Scotland and a long list of other regions furnish abundant similar examples. In these regions very poor soil, even when coupled with unfavorable topography and a climate much too cool for the best agriculture, does not reduce the density of population — even of the rural population — to less than seven or eight per square mile as in Vermont. No matter how poor the soil, the right kind of people and the right kind of climate can make it yield fairly large crops and support a fairly dense population. Artificial waterways, artificial topography, and artificial climate are far more difficult to create than is a rich soil. Look at Florida, with its sands; the soil in many sections is extremely poor, but fertilizers, energy and brains make it highly productive. In fact,

they often make the naturally poor soil more valuable than that which is naturally good.

Although poor soil is locally responsible for relative sparsity of population, it is doubtful whether it plays any large part in determining the location of the world's main areas of sparse population, except perhaps in the tropics. It certainly has little to do with the sparsity of people in the twelve million square miles that are too dry for agriculture. There by far the greater part of the soil is of the richest and most desirable types. Water, not richer soil, is the great need. In the thirteen and a half million square miles where we have ascribed the sparsity of population to low temperature, the opposite condition prevails, for most of the soil is undoubtedly poor, but scarcely worse than that in New England and Norway.

In the most sparsely populated tropical regions the soil is worst of all. The constant warmth and moisture cause the rocks to decay rapidly, and the constant rains leach away the plant foods almost as soon as they become soluble. The climatic conditions also stimulate certain kinds of bacteria which break down organic compounds so that little or no humus remains in the ground, and the nitrates which are so necessary to the majority of crops are almost lacking. Yet weeds grow with such extraordinary vigor that crops are choked and killed; bacteria are so abundant and virulent that the human inhabitants are terribly weakened by disease. Just how far the sparsity of population is due to the poor soil, and how far to weeds and disease, is not yet clear, but the deficiencies of the soil itself are mainly the result of the prolonged action of the same climatic conditions whose brief and immediate action hampers agriculture and promotes disease. Thus even if the soil of the warm wet regions is the direct agent in causing a sparse population, the climate is the great indirect agent.

The relief of the lands ranks with the soil in its effect on the

density of population. Mankind certainly needs level land; the world's greatest populations are all located in regions of gentle relief. But does a rugged topography prevent a population from becoming dense if other conditions are favorable? That mountains cause the population to be sparse is scarcely open to question, but no mountains anywhere in the world reduce the population to one or less per square mile unless they affect the climate. They may make the climate too cold, too dry, or possibly too wet for agriculture, but if the climate is favorable, the population is almost certain to be fairly dense even where the mountains are rugged. Japan is an extremely mountainous country, but it is likewise densely populated. Every little valley is tilled, and so are the slopes, except where they become so steep that the farms cannot cling to them, or so high that the temperature becomes too low. Java displays similar characteristics; there the mountain sides are often terraced so carefully that the height of the terrace walls is about as great as the width of the strips that can be cultivated. Syria is one of the most mountainous countries; villages cling precariously to the sides of steep limestone mountains, and often the water-supply comes from springs at the foot of great limestone cliffs. In order to bring the water to a bit of tillable land it may be allowed to drop a hundred feet in a picturesque waterfall onto a rocky terrace covered with mulberry trees for the silk worms. Yet Syria has a fairly dense population. Taking the country as a whole, there are fifty people per square mile, but if we leave out the mountainous portions that are too cold for agriculture and the regions farther inland that are too dry, this figure rises almost twice as high. Our own Kentucky mountains are often spoken of as highly rugged. Yet the rural population there amounts to over forty per square mile, which is as much as in the level state of Iowa. The province of Fukien in South China is extremely rugged, with mountains rising sheer from the sea all along the coast. But all save the steepest slopes are culti-

vated and the density of the population amounts to almost five hundred per square mile. Although the relief of the land is highly important, it practically never reduces the population of any large area to one per square mile unless it also injures the climate.

Are not remoteness, inaccessibility, and stage of civilization important reasons for sparsity of population—in northern Canada, for example? Yes, but remoteness and inaccessibility are relative terms and depend largely upon climate, soil, relief and the like. A hundred years ago few regions were more inaccessible from Europe than were California, southeastern Australia and New Zealand. Lapland, Iceland, Greenland, and the Saint Lawrence coast of Labrador were all much more accessible. So too, were the coastal sections of the Saharan and Arabian deserts, especially from countries like France, which border on the Mediterranean Sea. Yet thousands of people disregarded these more accessible places and made long, difficult voyages in order to settle in the much more remote regions around the Pacific Ocean. Today California, northern New Zealand, and the province of Victoria in Australia support not far from twenty people per square mile, but the more accessible regions mentioned above still have not much more than one. Their climatic handicap makes them almost as remote and inaccessible today as they were a century ago, whereas the good climate and other resources of the Pacific regions have attracted so many settlers that from Paris it is easier to reach California than Labrador or the western Sahara.

In the same way, so far as mere distance is concerned, Greenland is more accessible to Europe than is New England; yet cold Greenland is almost uninhabited, while Massachusetts has about five hundred people per square mile. We are often told that the position of Massachusetts, opposite the North Sea area, has caused it to receive the first impetus of immigration and trade from the most active parts of Europe, and hence is

a main cause of the rapid growth of population and development of industry. But Nova Scotia lies more than a half day's sail nearer to Europe; its harbors are good, and it has excellent coal of its own. Its settlers were essentially the same kind as those of New England; its civilization today surpasses that of New England in certain ways, such as respect for law, and it has long been noted for the ability of its sons and daughters. For many years the students from Acadia College in Nova Scotia had a higher average standing in the Graduate School of Yale University than had those of any other institution. Thus sociologically as well as geographically, Nova Scotia possesses no mean advantages. Yet the population is now only one-fortieth as dense as that of Massachusetts.

The trouble with Nova Scotia, as Professor R. H. Whitbeck has admirably pointed out, seems to lie not in its position with respect to the old European centers of civilization, but its supplies of food. So far as soil is concerned, Nova Scotia is about as able to raise food as is Massachusetts. The summers, however, are enough cooler and the winters enough longer, so that agriculture is less profitable. But such differences by no means explain the contrast between populations of twenty-five and five hundred per square mile. Only when modern communication enabled food to be brought from the western United States did Nova Scotia fall much behind southern New England. As soon as food could be brought from Ohio and farther west, where the soil is very rich, it was distinctly cheaper to bring it to southern New England than to Nova Scotia. In the same way, as soon as the cotton gin raised the textile industry to high importance, southern New England had an advantage because it was nearer to the cotton fields, and also to the market for manufactured goods afforded by the farmers who raised food on the western plains and cotton in the South.

In other parts of the world similar conditions prevail. Mon-

golia is extremely accessible from northern China; its borders are scarcely more than a hundred miles from Peking, while Indo-China, Formosa, Java and Hawaii are more remote. Yet, except during the last few years, far more Chinese have migrated to these latter places where agriculture is highly productive, than to Mongolia where drought is a constant terror.

Another impressive illustration of the relative importance of location, position, remoteness, accessibility — or whatever one may call it — is found in New Zealand. No sane person would deny that because New Zealand is located far away by itself in the southern hemisphere, it has a smaller population and much less importance to the world as a whole than it would have if it lay half-way between New York and Liverpool. Its capacity for supporting population may not be so great as that of the British Isles because of more rugged mountains, or as that of Japan because the climate is not so warm and moist. But these physical differences by no means account for the fact that while the old United Kingdom of Great Britain and Ireland, and the main islands of Japan, each have about four hundred people per square mile, New Zealand as a whole has only twelve. In this case mere remoteness seems to be so important that it may long prevent New Zealand from being a great manufacturing region, or from being highly populous. But is this remoteness as important as soil and climate? Iceland, Newfoundland and the northern island of New Zealand are all about the same size. Iceland is only eight or nine hundred miles from Liverpool, it has been inhabited by Europeans for more than a thousand years, and it might easily get food from America. Yet today, by reason of its unpropitious climate, it has less than a hundred thousand people — only two per square mile — and more than half the island is uninhabited. Newfoundland lies about nineteen hundred miles from Liverpool, and almost

within hailing distance of the world's greatest oceanic route. It has been known to Europe for four hundred years, and might easily and cheaply get food from the interior plains of America down the great Saint Lawrence waterway. Yet because of its unfavorable climate it has only about two hundred and seventy thousand people, or six per square mile. Part of it still belongs to the regions with less than one inhabitant per square mile. New Zealand, on the contrary, was not discovered by Europeans till 1779; the sailing distance from England, even via the Suez Canal, is about fifteen thousand miles, and external supplies of food are not so accessible as in Newfoundland. But it has a good climate. So today, in spite of the fact that a large area in the mountainous interior has less than one person per square mile, the North Island has three times as many inhabitants as Newfoundland, and seven or eight times as many as Iceland. Thus we conclude that while newness and remoteness are the main factors in determining the sparsity of population in New Zealand compared with Great Britain, climate is the most potent factor in causing the density to be relatively high in New Zealand in contrast with Iceland and Newfoundland.

If location, age, and stage of civilization are all taken into account, the real state of affairs seems to be this: — When regions where civilization is low come into contact with regions where it is high, the density of population in the "new" region for a while depends largely upon the relative locations of the various places and upon the length of time that the new regions have been in contact with the higher civilization. As time goes on, mere location and age have less and less effect. If the climate, soil and relief attract progressive people in even moderate numbers, lines of transportation are sure to be developed. Today New Zealand and Australia can be reached from Europe, America, Japan or almost any civilized part of the world far more comfortably and by far more frequent service than can the

sparsely populated coast of Somaliland. Yet Somaliland is an "old" region lying directly upon the main route from Europe to India and the Far East. New Zealand and Australia have grown rapidly in population, and will doubtless continue to grow, whereas Somaliland remains almost unchanged. Iceland, Newfoundland, Nova Scotia and Maine, in diminishing degrees, are like Somaliland. At first, their location in reference to northwestern Europe helped them. Today they have lost that advantage because other conditions, especially climate and soil, have caused a new center of civilization to be located in North America.

In all this discussion we must bear in mind that we live in an age when the newness of America and Australia, and even of other regions like South Africa, is only just wearing off. We are therefore unduly impressed by the importance of mere location in respect to northwestern Europe. We are always hearing that the newness of a region is the reason why it has no population worth mentioning, and no lines of transportation, and why only the most ardent pioneers want to go there. Since the days of Columbus this has undoubtedly been true, but it represents a highly unique condition which is rapidly dying out. Even in the United States mere newness will soon cease to count much in determining the density of population. Nevada is scarcely newer than California, but it has about seven-tenths of a person per square mile while California has twenty-two. Wyoming can hardly be called newer than the state of Washington, but Wyoming has two people per square mile while Washington has twenty. Newness, like remoteness and accessibility, is indeed highly important, but its effects rapidly disappear.

Our final conclusion is that in the long run, soil, relief, and especially climate are the main determinants of where people shall live. Soil and relief are especially important in determin-

ing *local* differences. Mere location on the earth's surface, apart from climate, is mainly important when the discovery of new lands, the development of new types of human culture, and the occurrence of great migrations upset the relatively stable conditions which normally prevail. In recent centuries such factors have probably been more important than ever before, or than they are likely to be for thousands of years, but their effect is passing away. Back of all these other factors lies climate; it paints the background of the picture; other factors sketch the details.

CHAPTER III

THE EFFECT OF GEOGRAPHIC EXTREMES

THE sparse populations described in the preceding chapter are systematically found in the most repressive geographic environments, and stand very low in the scale of civilization. An environment which is repressive at one stage of human development may indeed be relatively favorable at another, but that does not affect our principle. Thus Australia was repressive so long as it remained isolated from the rest of the world. One reason was the vast deserts, which are still repressive. Another and far more potent reason was the complete absence of indigenous animals which could be domesticated and form the basis of the pastoral mode of life, and the almost equally complete absence of plants capable of sustaining man as an agriculturist. No race has ever been known to advance far toward civilization without agriculture. Thus the Australian environment was highly repressive until wheat, barley, cattle, sheep, and other useful plants and animals were introduced. Precisely the same is true of California where the aboriginal Indians stood at the very bottom in the scale of civilization, whereas for people of European culture, the environment is highly favorable.

For our present purposes the best way to understand the true relation between man and his environment seems to be to take a relatively few typical examples and treat them quite fully. The Kalahari Desert in southwestern Africa — “the southern Sahara” — furnishes an excellent example of an environment that is repressive because of its extreme aridity. Although the

Kalahari is nothing like so large as the Sahara — only a hundred and twenty thousand square miles compared with three million — it is equally inhospitable, as the Boers found in 1878. In that year a party of Boers, unwilling to submit to the annexation of their country by Great Britain, trekked northwest across the Kalahari to Lake Ngami with about three hundred wagons. They were on their way to the interior of Angola. Water for the animals soon gave out; the cattle grew weak and died; and finally there was no water for the people. Men, women and children died of thirst. Those who survived say that about two hundred and fifty people and nine thousand cattle perished.

In the central part of the Kalahari Desert the Boers found a great ocean of red sand. The crests of the waves were the tops of sand dunes rising from thirty to a hundred feet, while between them lay broad, flat troughs of varying width. On some of the dunes the sand was loose, but a great many were covered with tough, sunbleached grass growing knee-high in clumps at intervals of about fifteen inches. Here and there the travelers came upon dry stream beds where rivers once flowed long ago. Elsewhere the weary oxen found relief as the creaking carts moved easily across broad level stretches, flat as a floor. These "playas" or "pans" turn into shallow lakes if the scanty summer rains are sufficiently abundant, but the water is usually brackish and never lasts long. Sometimes as it dries up, it deposits a bed of sparkling salt crystals which give a curious beauty to the otherwise monotonous scenery. The Boers saw plenty of dry stream beds, playas and salt, but the water that they sought could not be found.

Not all of the Kalahari Desert consists of sand. In the outer portions long finger-like tongues of sand alternate with stretches of grassy land called veldt. Still farther from the center of the desert, especially on the west and north, the grasslands give place to dense scrub and occasional patches of forest. Even in



PLATE III. THE CACTUS DESERT OF ARIZONA.

Show the peculiar forms assumed by desert vegetation in the United States. This is the kind of environment which promotes a wandering, unsettled mode of life.



PLATE IV. APACHE HUT OF BRANCHES IN ARIZONA.

As environment affects the Indians such as the Kalbbsan environment affects the Bashmen.
(Courtesy American Museum of Natural History.)

the central parts, and still more on the margins, one of the most characteristic features is the herbaceous plants which quickly spring up from drought-resistant tubers as soon as the scanty summer rains begin in earnest. One of the most remarkable plants is the watermelon, both sweet and bitter. The bitter kind has leaves like an ordinary watermelon and most beautiful little mottled green fruits with the bitterest taste imaginable. Both kinds supply man and beast with water. Another remarkable feature of the desert is the abundance of game, including the lion, leopard, zebra, jaguar, baboon, ostrich, and many kinds of antelopes such as the kudu and gnu. Along the few more permanent rivers, the hippopotamus, rhinoceros and elephant are found, while giraffes and elands are by no means unknown. Of course these animals are largely confined to the border regions where they swarm around the water holes. In the wet season however, they wander far and wide, and some of them reach the sand, for the succulent herbage that then shoots forth with almost miraculous speed, enables them to live for weeks without a drink.

This curious desert is the home of three kinds of people; one is the Bushmen who live entirely by hunting, and inhabit the worst parts of the desert; the second and most numerous, is the Ba-Kalahari, or men of Kalahari, who depend mainly upon hunting, but live where the desert is not quite so extreme as in the home of the Bushmen, and hence are able to keep a few animals and practice a little agriculture; the third is the Hottentots who inhabit the desert border and depend mainly on cattle, although practicing a little agriculture.

These three races are extremely interesting because they represent three stages of development, and three types of adaptation to a desert. The Bushmen illustrate the effect of the desert upon people whose stage of culture is very low. Of course the ancestors of the Bushmen came from some other

environment, and doubtless brought with them habits which were not appropriate to the desert, but that was long ago. Today the earlier adaptations are practically lost, and there remain few characteristics save those which are appropriate to a desert people who not only have no domestic animals except the dog, but live in an environment so dry that it is almost impossible to keep any.

How far the physical features of the Bushmen reflect the desert environment it is impossible to say. They are very short people, the men averaging scarcely five feet. Their dirty-yellow faces are described as rather unattractive, partly because of the long low skulls, large prominent cheekbones, and deeply set eyes which give the face a crafty expression. The nose is small and flat, and the wide mouth, projecting jaws, and protruding lips give an animal-like appearance. These characteristics probably antedate the desert, and at least have no known relation to the geographic environment. Nevertheless, like most desert people, the Bushmen are slim, lean, almost emaciated. Even the children lack the dainty roundness which is so pretty in those of more favored regions. So little fat accumulates under the skin that in both men and women the skin often seems as dry as leather and falls into strong folds around the stomach and at the joints. Crooked backs and protruding stomachs are also common, although many of the Bushmen are well proportioned. In spite of all these seeming defects, the Bushmen are active and are capable of enduring the greatest privations and fatigue, for none who are otherwise can survive in so harsh an environment.

These primitive people go about almost naked, for the temperature is never very low. What clothing they have is composed of skins of animals. Practically no other material is available, and none can be purchased because the desert does not permit the people to accumulate a surplus sufficient to pay

for clothing from other regions. The men often wear nothing except a triangular piece of skin which passes between the legs and is fastened around the waist with a piece of string. Many of the men, however, and nearly all the women wear the kaross, a kind of cape made of skins sewn together and used as a wrap at night. For footgear both men and women wear sandals made of hide or else of plaited bark. In the absence of clothing, the people need something to keep away the insects. Accordingly both sexes smear their bodies with a kind of native ointment. Dust soon gathers on this and forms a sort of coating like a rind. As bathing is almost unknown, this constitutes a more or less permanent protection, not only from insects, but from the scratching of the bushes.

The way in which the desert limits the Bushmen is seen in their crude attempts at ornamentation. They decorate their necks, arms and legs with all kinds of teeth, hoofs, horns and shells, which they find in their wanderings through the desert, and stick in their hair rare feathers or the tails of hares. Of course they have a few ornaments which come from other parts of the world, chiefly beads and rings of iron or copper. In order to make their faces beautiful, the women follow the same practice as in America, staining their faces with a red pigment made from the rocks around them. Tobacco is another of the few luxuries which the Bushmen obtain in exchange for the skins of animals. It would be too expensive to carry this in imported tobacco pouches, so the horns of goats are used, or the shells of a land tortoise. A jackal's tail, tied to the end of a stick, is used sometimes for a fan, and sometimes for a handkerchief.

The dwellings of the Bushmen are made of matting woven from reeds which grow in swamps along some of the dwindling rivers. In the plains the low huts of reed matting are often placed above holes in the earth; in the mountains they may take

the form of shelters on the windward side of holes among the rocks. Almost no people in the world have fewer household utensils. Practically the only receptacles are ostrich egg-shells for water, and occasionally a few rough earthenware pots. The food, which of course is practically all meat, is cooked by merely holding it over the fire; and fire is obtained by rubbing hard and soft wood together. Equally primitive people are found only in equally repressive environments.

In spite of their primitiveness, the Bushmen are very clever in their methods of hunting wild animals. Their knowledge of the habits and movements of every kind of wild animal is marvellously keen and accurate, as appears in their favorite practice of following a herd of antelope in its migrations and killing the animals one by one without driving away the rest. The chief weapon with which they do this is a bow, cut in the bushy region on the borders of the desert, and strung with a sinew from some of the larger animals which they kill. The arrow likewise is made of the material that is most available, namely, a reed, about the thickness of a finger and two or three feet long. It is wound with thread to keep it from splitting, and is notched at the end for the string. Iron is too rare and expensive to be used for the heads of arrows which may be easily lost, so the arrow is pointed with bone or stone and a quill is attached to make a barb. Only in rare cases and for special purposes can the Bushmen afford to use iron arrows which they obtain from their Bantu neighbors. Yet curiously enough, tobacco, which only left America four hundred years ago, has penetrated to the Bushmen. So great a solace do they find in it, that when they cannot raise it they sacrifice almost anything to buy it from their neighbors of other races.

With their ordinary bows and arrows the distance at which the Bushmen can be sure of hitting the game is not over fifty feet, yet the clever fellows succeed in approaching thus closely

to even the most timid animals. Even at this distance the light reed arrows would not be very effective were not the tips coated with a gummy, poisonous compound which kills even the largest animals in a few hours. This compound is prepared very cunningly and Europeans have not found out just how it is made. It is known, however, that it contains the murky juice of an abundant amaryllis or of a euphorbia, together with the venom of snakes or of a large black spider, or the entrails of a very deadly caterpillar, this latter being often used alone. These poisoned arrows cause the Bushmen to be greatly feared by the races who live around them. The Bushmen must have exercised extraordinary persistence and intelligence in testing the sap of every available plant and the minute organs of innumerable insects and larger animals in order to discover those that make the best poisons. Their ingenuity in this respect vies with that of other primitive men who long ago tested all possible plants and animals to see which could best be domesticated. But the search for poisons leads up a blind alley, whereas the other search led onward to agriculture, transportation, and many other broad avenues of progress.

For use at close quarters, the Bushmen again use the thing that they can most easily procure, namely, a club about twenty inches long with a knob as big as a man's fist at the end. Even in our day, knives and spears with their sharp metal cutting edges are too expensive for most of the Bushmen. The scanty resources of the desert do not allow them to accumulate enough capital to purchase even such obviously useful implements. Almost the only other implement of the Bushmen is a rude digging stick, consisting of a sharpened spike of hard wood inserted in a round flat stone with a hole in it. The stone is fastened to the stick by a wooden wedge driven into the hole. The stick is used by the women to dig the succulent tuberous

roots of various plants that grow in the desert. It is also used to dig pitfalls for animals.

The skill and endurance which the Bushmen display in procuring food are extraordinary. Sometimes, for example, they actually run down many kinds of game, pursuing them relentlessly until they themselves are almost exhausted and the game is completely exhausted and bewildered. On their own legs they do what we modern people pride ourselves on being able to do by means of fast automobiles. Another special accomplishment is the ability to imitate the cries of birds and beasts so cleverly that the creatures draw near. This is one of the Bushman's best methods of getting within striking distance of the animals which are almost his sole means of livelihood.

Such traits present one of the most interesting questions to the geographer, sociologist, psychologist, and student of history. The Bushmen undoubtedly display an extraordinary degree of skill in certain highly specialized lines. Their powers of observation, of endurance, and of patient persistence apparently far surpass those of the average civilized man. But are these powers innate, or are they merely the result of training from infancy? Could the Bushman be equally well trained to the steady industry required by agriculture, or to the life of the merchant with its physical inertness and its necessity for constant study of the desires and characteristics of his customers? Doubtless these questions will always be debated, for the simple reason that such traits as those of the Bushmen are partly innate and partly the result of practice.

A little reflection shows that we are dealing with one of the most fundamental of all principles involved in the study of geography. That principle is that the physical environment, either directly or more often through the type of occupations which it favors, exercises a selective effect. For example, in a region such as that of the Bushmen, where the desert is too

dry to permit the use of domestic animals to any appreciable extent, the man who is fat and sluggish is almost doomed to destruction. With the resources available to him, it is impossible for such a man to procure sufficient game to support himself and his family. So too, with the man who lacks the sort of endurance which enables him to follow the fleet antelope for hours. He is equally doomed to destruction if he is so clumsy that he cannot approach cautiously and warily, without disturbing the game. The absence of good eyesight may be equally fatal. Certainly the man who is not a keen observer of nature can never hope to get a living as a hunter in the wild desert. Thus certain types of people almost inevitably tend to be weeded out.

On the other hand, the thin, wiry person who can go a long time without food, the one who is fleet and light-footed when approaching game, the one who is especially skilled in imitating the cries of animals and birds, especially keen-eyed and quick of hearing, and above all the one who not merely observes keenly but reasons correctly from his observations is enormously helped towards survival. He is able not only to preserve his own life in times of scarcity, but to obtain a surplus sufficient to support his wife and children. Therefore, if there is any such thing as the inheritance of physical and mental qualities, it seems inevitable that an environment like that of the Bushmen must tend, in the course of many generations, to weed out those who depart too far from the type described above.

At this point, the social phase of the matter enters in. The youth who is skilled along the lines here set forth is especially desirable as a husband; the parents of marriageable girls seek such a youth. He becomes the ideal, and therefore gets the wife who also approaches most closely to the feminine ideal. Whatever that ideal may be, it always includes good health and

physical strength of the kind which makes a woman best able to bear children and rear them. Thus social selection, through the institution of marriage, joins with what we may call purely natural selection through ability to get a living, and puts a premium on a certain type of physique and mentality.

There is still another side to the matter. The father and mother who approach most nearly to the type which is ideal from the point of view of survival, naturally try to train their children along similar lines. The less competent people also do their best in this respect. So important is this that the training of the children often seems to students of sociology to be the sole cause of the qualities which it aims to develop. The fact is, however, that among the Bushmen, and among practically every other type of people, the selection due to physical environment, occupation and social ideals, tends to cause a certain type to become the ideal. Then education seizes upon that type as its aim, and still further intensifies it. Every environment favors some occupations and makes others of less importance or even impossible. Each also generally favors some types of physique more than others. Thus everywhere, in the long run, both the physique and the mentality of the people tend to become adjusted to the environment, and the adjustment becomes still better because training ordinarily works in the same direction.

Turn now again to the Bushmen. Another of the traits where they are extraordinarily well adapted to their environment is their habits in regard to eating. Often game is so scarce that the Bushmen are on the point of starvation. For days at a time they search almost in vain for food. At such times, lizards, snakes, frogs, worms and caterpillars are eagerly devoured. Lice and ants are by no means despised, being always eaten raw, and the eggs of the ants being regarded as especially delicious. Yet when such foods fail, the Bushmen survive in

the face of hardships which would be fatal to persons of a less tough and sinewy physique, or with less of the temperament which makes them accept privation without nervous strain. On the other hand, when the Bushmen find food, they eat ravenously; it is said that five adults will eat a whole zebra in a few hours, — entrails and all, half-cooked and often raw. The greatest delicacies, such as the occasional honeycombs found in the desert, and the tubers and roots which give relief to a monotonous animal diet, are also eaten voraciously without much thought for the morrow. Is this an indication of thriftlessness on the part of the Bushmen? Perhaps, but it is the natural, in fact, the almost inevitable, result of their mode of life. Not only do they often need large amounts of food when they have been half-starved, but in their hot climate the meat of a zebra, for example, will keep only a short time. To attempt to preserve it and carry it around with them would in many cases merely mean losing it.

One of the most interesting things to the geographer and to every other student of mankind, is the way in which moral characteristics seem to be associated with certain occupations and modes of life. The Bushmen, for example, are accused of being extremely cruel. And so they are. To the white men who settled around the borders of the Kalahari desert, the Bushmen were a veritable scourge. One of their favorite methods was to make raids on the cattle and drive them off in large numbers. Their relations to the white man were almost identical with those of the Apaches of Arizona and New Mexico to the early American settlers. Naturally, such a state of affairs brings out the most cruel side of both parties. Bushmen, like the Apaches and practically all wandering people of the desert, regard raids as one of the legitimate means of making a living. They are the only available resource when every other means of obtaining food has failed. Under such circumstances, the early white

men naturally hated the Bushmen, and made systematic plans for their wholesale destruction. Cruelty met cruelty, for both races were living under conditions which almost invariably bring out that quality.

In other ways beside raids the Bushmen have the same characteristics as other desert people such as the Arabs, Turkomans and Mongols. They are passionately fond of freedom, for example; not because of high moral ideals, but simply because each man must fend for himself, and because the man who refuses to submit to the will of others is not killed off or ostracized as he is in more settled communities. The Hottentot neighbors of the Bushmen easily and almost willingly permit themselves to be made slaves, but the Bushman himself will fight to the last gasp for his personal liberty. Someone has described him as "the anarchist of South Africa." This does not prevent him from voluntarily becoming a servant, for sometimes he does so, and is considered trustworthy. What it means is that his mode of life neither gives him a training in submission nor eliminates those who refuse to submit.

Among the Bushmen, as among other nomadic people, the mode of life makes it impossible to have anything except a very loose type of political organization. In fact, the word "political" can scarcely be used, for there is almost no tribal organization. Each family runs itself as a rule. Sometimes, to be sure, in special circumstances, as when game is abundant and a large herd of antelope is being followed, it is an advantage for several families to act as a unit. Then they join together and appoint a chief, but the arrangement is never more than temporary. Why should it be? Under such conditions, the individual families, or at most only two or three families, most generally live separately; otherwise there would be too many people for the scanty supply of game.

Courage is another Bushman quality which appears in prac-

tically all nomadic and desert people. Old residents, who seem to know what they are talking about, say that with a dozen Bushmen behind them, they would not be afraid of a hundred Kafirs. The fear inspired by the Bushmen, like that inspired by the American Indians in early colonial days, is said to have had a good deal to do with the cutting down of the trees around the early settlements in the more fertile lands south and east of the Kalahari Desert. If the "bush" were removed far and wide around their dwellings, the colonists had much less fear of the raids of the Bushmen.

Another evidence of the highly specialized mentality of the Bushmen seems to be found in the singular lack of success of missionary work. The ideas of Christianity are said to have no appeal whatever for the Bushman type of mind. Christianity is a peaceful, agricultural sort of religion. The Bushmen have no interest in either peace or agriculture. Christianity teaches industry, but industry in the ordinary sense of the word does the Bushmen no good. It teaches "thou shalt not steal," but when no food can be procured from the chase or in any other occupation open to the Bushmen, how can one keep his family alive except by making raids? If one makes raids as part of his regular work, he must sometimes kill people as a part of the day's work. So why, says the Bushman, should he adopt a religion that would spell failure at the most crucial of all crises? Even though the Bushmen may not put the matter that way, that is the inevitable result of their mode of life, their innate temperament, and their training; and all three of these depend on the extremely harsh and unproductive geographic environment. In this respect, as in a hundred others, the Bushmen act and think as one would expect from a study of similar environments elsewhere.

CHAPTER IV

THE DESERT BORDERLANDS

ONE of the most interesting phases of human geography is the way in which certain habits and mental traits are rapidly transformed when people migrate from one environment to another, whereas other habits and traits are almost interminably preserved. A man who migrates from latitude 30° to 60° must change his mode of dress and clothing, or perish. But if women take their husbands' names when married, it is hard to see how any degree of change in geographic environment could alter the custom. Such a habit does not impose a handicap in any type of environment.

The way in which the environment picks out some traits for extermination or survival when people go to new regions can easily be seen by comparing the Bushmen of the last chapter with their neighbors the Ba-Kalahari in the parts of the desert that are not quite so bad, and the Hottentots in the more fertile border.

The Bushmen, as we have seen, live in the most extreme part of the Kalahari Desert of South Africa. They have no cattle or other domestic animals except the dog and cannot keep any because the desert is too arid. Whatever they may have been in the past, the severity of the desert has now made them hunters pure and simple, almost completely adapted to a wandering and highly precarious life, and endowed with a corresponding physical and mental equipment. The Ba-Kalahari are much more recent arrivals, though no one knows when they came. One of the most interesting facts about them is that their character

and tastes seem to be appropriate to an environment quite different from that of the desert. They appear to have been driven into the desert by invading Hottentots. When they first came vaguely into view, they appear to have lived outside the desert and to have had great herds of horned cattle. The Hottentots apparently drove them into the borders of the desert and largely took away their cattle. At a later date they were pushed still farther into the worse parts of the desert when the Bantus, who are known as Zulus and Kafirs, overwhelmed the Hottentots and drove them also desertward. Being thus driven into an environment where cattle-keeping is almost impossible, the Ba-Kalahari had to change their habits and adjust themselves to hunting as the main mode of life.

But old characteristics are highly persistent. Unless they form an important obstacle to survival, it seems to take many generations to weed them out. In the case of the Ba-Kalahari, we may suspect that originally they were not merely herders, but also agriculturalists. At any rate, although they live in the desert, they are said to have a genuine passion for both agriculture and cattle herding. This is manifest in the care with which they raise a few melons and pumpkins wherever they can find water, and keep a few small herds of goats. If they relied wholly on such slight resources, however, most of them would soon disappear. So perforce they have learned to be clever hunters, with something of the skill of the Bushmen.

Unlike the great majority of pastoral people, but not unlike many people among whom agriculture has long been established, the Ba-Kalahari are relatively peaceful and timid. They also differ from their neighbors in being grave and almost morose, as is often the case among people who are timid. Livingstone says that he never saw the Ba-Kalahari children at play.

The fondness of the Ba-Kalahari for agriculture and herding doubtless helps them to survive, since it aids them in using such scanty supplies of water as are available. Their timidity would seem to be a distinct handicap which would tend toward their extinction. The clearest point, however, even though no exact facts are available, seems to be that the Ba-Kalahari who were not able to adjust themselves to the life of the desert hunter must have been rapidly exterminated. If parents could not procure food for their children, their line must have perished, unless perchance they left their people and yielded themselves as slaves to their neighbors in the better environments round about. In some such way, apparently, the Ba-Kalahari have become adjusted to the life of the desert hunter. They have doubtless acquired skill in hunting through the hard school of experience, but they have presumably also undergone a biological selection which has exterminated the stocks that were not able to become good hunters.

All over the world the same thing seems to be happening. People who migrate from one geographical environment to another are compelled not only to face new conditions of health, food, shelter and clothing, but especially to enter new occupations or employ new methods of carrying on old occupations. Any innate traits or acquired habits which are positively harmful in the new environment tend to be eliminated by natural selection, but other traits or habits which are not harmful may persist indefinitely, even though they have no special relation to the new environment. In this lies, apparently, the explanation of many cases where people seem to be closely adapted to their environment in some ways, although other prominent traits appear to be adapted to quite a different environment.

A Ba-Kalahari method of obtaining water furnishes an interesting example of the way in which a people who have been forced to migrate into an arid environment have invented or

adopted a new and clever device. Here and there the desert contains hollows in the sands where water can be obtained at a depth of a few feet. Generally such places are in the beds of the many channels which cross the desert and seem once to have carried large streams, although now they are waterless year after year. The first thing which the Ba-Kalahari do in such a place is to dig a hole deep enough to reach moist sand. Then a bunch of grass is tied to the end of a hollow reed, and placed at the bottom of the hole. The damp sand is rammed firmly down around the grass, and a water-drawer — generally a woman — sits down with the other end of the reed in her hand. Opposite her on the ground she places the shell of an ostrich egg, for the Ba-Kalahari, like the Bushmen, are so primitive that such shells are their usual vessels for water. Taking the reed in her mouth, the woman sucks vigorously. Water seeps out from the wet sand, and finally she is able to draw it into her mouth. When her mouth is full, she cleverly squirts the water into the egg shell. In order that no water may be lost, she holds in her mouth not only the end of the reed, but a straw running to the egg shell, and down that the water runs. When the shells are full, they are covered and buried. The Ba-Kalahari often procure stores of water in this way and hide them so that they cannot be found in case of the sudden raids to which they are subject at the hands of the Bushmen and Hottentots. The early travelers in the Kalahari were never able to find these supplies of water, although they knew of their existence. No amount of bullying or persuading would cause the Ba-Kalahari to provide water, but as soon as cordial and friendly relations were established, the natives always seemed able to find it no matter how dry the country might be.

Just as the Bushmen represent the full response of primitive man without domestic animals to the most rigorous kind of desert, and the Ba-Kalahari the modified response of a pastoral

and agricultural people who have been forced into parts of the desert only a little less arid, so the Hottentots represent the response of a cattle-raising people to the part of the desert where there is grass enough for herds, but where agriculture is generally not profitable. Some authorities do indeed hold that the Bushmen, Ba-Kalahari, and Hottentots represent three successive stages of development, and that none of the stages can be regarded as permanent. It is doubtless true that no stage in human culture is really permanent, for new discoveries may be made anywhere at any time, new plants or animals may be introduced, and new ideas and methods may also be introduced from abroad. Nevertheless, *so long as no such new factors enter into the situation*, the modes of life of the Bushmen, Ba-Kalahari, and Hottentots respectively appear to represent a relatively complete and permanent adjustment to the most extreme desert, the desert which is not quite so rigorous, and the grassy borders of the desert where cattle can thrive but agriculture without irrigation is too precarious to form the main basis of life.

It is indeed true that the Hottentots have a great cultural advantage over the Bushmen and Ba-Kalahari because they depend upon cattle rather than upon the chase; but they are able to profit by that advantage only because they live on the borders of the desert instead of in its driest parts. They illustrate two of the most fundamental geographic principles: the first is that as men rise in the scale of culture their reactions to their geographic environment become different; the second is that while relatively low types of human culture are able to survive in almost every environment aside from ice-caps and the most extreme deserts, the higher types thrive and advance only in better environments. Each type of human culture appears to develop most fully in its own environment and tends to be modified as soon as it is transferred elsewhere. These two



PLATE V. HUTS OF SALT GATHERERS BESIDE THE DEAD SEA.

Near the mouth of the Jordan River is a deep desert trench where the tides of the Dead Sea come within a dozen miles of Jerusalem until the British stopped them.

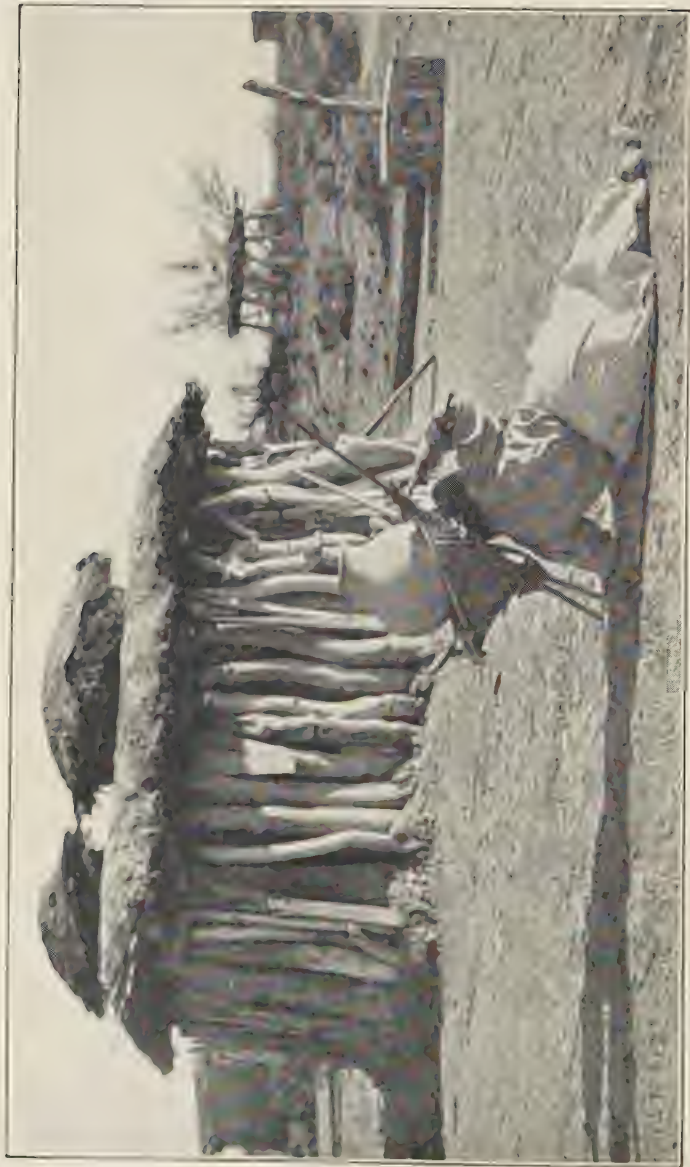


PLATE VI. PIMA HOUSE AND WOMAN WITH LOAD IN ARIZONA.

The Pima Indians are desert people who are in an intermediate stage between desert wanderers and settled agriculturists depending on irrigation. (Courtesy American Museum of Natural History.)

principles go far toward explaining a great many of the most outstanding facts of geography, sociology, and history.

To return to the Hottentots, they are primarily nomadic herders. Since cattle are their chief animals, their habits are a little different from those of similar people in similar environments who depend mainly on sheep, camels, or other animals. But the differences thus occasioned are insignificant compared with the high degree in which not only the mode of life but the mental character of the Hottentots resemble those of other nomadic herders such as the Arabs, Turkomans, and Khirghiz. The most important fact in the lives of the Hottentots is not merely that they have to depend on grass for a living, but that no other mode of life except hunting is available. This means that so long as they are not helped by people of higher culture, who, under better circumstances, have discovered how to pump water from deep wells, and store large supplies of hay, they must be nomadic.

It makes little difference whether the animals that nomadic tribes depend upon are cattle, reindeer, yaks, camels, sheep, goats, horses, or llamas. It makes little difference whether they are pastured in a very cold or a very dry region. Whichever may be the case, the supply of grass is not only limited in amount, but is renewed only at long intervals, for the growing season is usually too short for the grass to spring up more than once each year. Under such circumstances, if a herd or flock, large enough to support a small group of families is kept for any great length of time in one place, it will soon eat up all the available grass within easy reach of a favorable camping place in cold regions, or of a water supply in the desert. This would not be true if the temperature were sufficiently high all the year round, or if the rains were so abundant that the grass could keep renewing itself for many months, or could be easily turned into hay in large quantities. But in the regions that we are

talking about, one of the greatest characteristics is the parsimony of nature, her failure to provide vegetation except in small quantities and at long intervals. Therefore if the people of the very dry and the very cold regions would keep their animals in fit condition, and would have meat and milk from them all the time, they must drive them from one pasturage to another. So they too, like the hunting people, have to be nomadic. Thus nomadism is the central feature in the human life of vast areas that are too cold or too dry to support more than one person per square mile.

At each encampment among the Hottentots, as they were before the coming of the white man, the huts were generally placed on the smoothest and grassiest spot available, just as among the Arabs and especially the Khirghiz. There the huts were set in circles of varying size according to their number and that of the cattle. The huts, like those of the Bushmen and Ba-Kalahari were made partly of skins and partly of reed matting. In the center of each a hole served as a villainously smoky fireplace, while round about it the sleeping places of the family were marked by a series of little hollows where the earth had been dug away for an inch or two to accommodate the hips and other projecting bones of the sleeping Hottentots. Within the tent the supply of utensils was extremely scanty, not only as befits the poverty which is the usual lot of nomads, but as is necessary where all the household goods must be packed up every few weeks and transported to new pastures on the backs of cattle. Yet the household goods, even before the coming of the white men, were more extensive than those of the Bushmen. This was natural, for the Hottentots not only needed more because they had to take care of milk, but they had greater wealth than their more primitive neighbors by reason of their cattle, and were more easily able to transport their material possessions for that same reason. So we find in their huts tortoise

shells for spoons and dishes; calabashes, bamboos and skins for holding milk and butter; a few earthen vessels and well-made bowls of hollowed wood for cooking and other purposes; and mats of rushes interwoven with bark (bast) to sit and lie upon. These almost complete the list, but they represent nearly all that one finds in the tents of almost any nomads, and nearly all that is compatible with the nomadic mode of life.

Just as the household appliances of the Hottentots were very simple and yet a little more elaborate than those of their neighbors in the less favorable part of the desert, so their weapons and dress were primitive but a little better and more varied than those of the more strictly desert people. Thus, although bows and arrows were their primary weapons, and wooden knob-kerries a secondary type, iron-tipped assegais or spears were also not uncommon. This was true even before the coming of the white man made it much more easy to procure iron.

In those old days the Hottentots, like their Bushmen and Ba-Kalahari neighbors, dressed almost entirely in skins. The skin coat, or *kaross*, was worn across the shoulders, and a smaller one around the loins. These cloaks were worn all the year round, the hairy side being turned inward during the winter and outward during the summer. The Hottentots even slept in them at night, and were buried in them when they died. In addition to the *kaross*, the women wore a little apron to which they hung their ornaments, and underneath this one or two fringed girdles, while a skin cap adorned the head. Even now, when the Hottentots procure cotton cloth from Europeans, their clothing is almost as simple and inexpensive as in the past.

It would be interesting to describe many other habits of the Hottentots, but we must limit ourselves to a few which illustrate the way in which the cattle-keeping mode of life which is possible in the grasslands not only made the Hottentots more

prosperous than the Bushmen, but apparently altered their habits and character. One of the characteristics which the older writers especially emphasize, and in which they all agree, is the friendly, hospitable character of the Hottentots. These people despised anyone who would eat, drink or smoke alone. When strangers arrived, they set forth the finest feast that they could prepare, even if it impoverished them for weeks. Such unstinted hospitality is one of the most prominent qualities among practically all nomadic keepers of animals. Sometimes it is ascribed to the fact that because the nomads travel so much, they constantly meet new people and therefore lose all fear of strangers. This is true, but not the whole truth. Hospitality appears to be not only an acquired but an inherited characteristic, for it is highly important as a means of self-preservation.

Compare the Hottentots in this respect with the Bushmen hunters on the one hand, and with settled agricultural people on the other. The Hottentot, because he has animals, is always on the move, not only when he transfers his camp to a new place, but still more often when the cattle stray, as happens continually. As soon as it is discovered that the fear of wild animals or some other cause has driven some of the animals away, the nomad must immediately start in pursuit, even though without supplies of food and water or a wrap in which to sleep. If he meets a stranger, who is perhaps also searching for lost cattle, it is of the greatest advantage that the two should exchange information in friendly fashion, and perhaps combine to search where neither has yet looked. If night comes on, and the animals are not found, it is a great advantage to be hospitably received and helped next day by anyone whose camp happens to be near.

But how is it with the hunter? The last thing he desires is to meet people. If he is trailing an animal, the arrival of

another hunter may drive the animal away, or the other man may get the game, and at the same time disturb the neighborhood so much that the other animals also flee away. So as the hunter wanders in search of game, his object is to avoid the habitations of his fellowmen. The others do not want him any more than he wants them. Naturally, then, hospitality and friendliness are of little advantage to the hunter and may be a distinct disadvantage. The man who is too friendly in temperament may actually diminish the food supply of both himself and the others.

Among agricultural people quite a different situation prevails. Hospitality may not hurt them, but it is of no such great advantage as among the nomadic cattle keepers. The farmer works on his own land, his animals are generally fenced in. Only rarely does he have to go long distances, and then he usually knows just where he is going. He can definitely plan to spend the night at some familiar place. Moreover, the population at the market towns which are his most frequent goal is usually large enough so that there are places which make a business of entertaining strangers. Only rarely and in regions where the population is sparse, is it necessary for the farmer to drop in on the neighbors unexpectedly for the night. Of course a friendly disposition and the spirit that makes one man help another are advantages everywhere. But the open-hearted hospitality and keen delight in meeting strangers which are characteristic of nomads are not of special survival value to the hunter or farmer, whereas they are to the cattle-keeper. Although the matter has never been statistically tested, this value is probably so great that in the course of ages it produces a genuine selective effect. We all know that some people are innately hospitable, while others are not, and we infer that during the course of uncounted generations, nomadic keepers of cattle have tended to become more hospitable than people of

other occupations, not merely by training but by actual inheritance.

Another characteristic which the Hottentots share with practically all pastoral nomads is physical and often mental indolence among the men. Nevertheless they are capable of arousing themselves to sudden and extreme activity. Here, as in other cases, no one can say how much of this is due to training, and how much to innate character, but the argument is precisely the same as in respect to hospitality. When the cattle are quietly feeding on good grass near the tents, there is practically no work to be done aside from milking them, and that is ordinarily left to the women. Suppose, however, that the animals stray to a considerable distance and then begin to follow those from some other encampment, or suppose that a storm arises and the cattle begin to drift before it. Or perhaps wild animals approach the herd and stampede it, or raiders from another tribe swoop down upon the herds.

Under each of these conditions, what kind of man succeeds in saving his property and in insuring a supply of food for himself and his children? Obviously it is not the steady-going man who has been laboriously at work upon something else and who starts after his animals at the slow, dogged pace of the man who is already wearied with the day's work. It is the one who jumps to his feet, fresh and rested, and pursues the animals with the utmost ardor. Such a man, no matter how lazy he may be the rest of the time, succeeds in the main work of life, for his flocks and herds are not depleted. Thus indolence, joined with the power of sudden and extreme activity, is one of the most prominent characteristics of pastoral nomads all over the world.

People who are often called upon for such extreme exertion cannot be fat and heavy; they must be slender and well proportioned. Their hands are not likely to be large — large hands may even be a disadvantage for they imply large, flat feet

which are not so good for running or for jumping onto a horse as are the smaller feet with higher insteps. On the contrary, a large strong hand is a great advantage to the farmer. Therefore in the course of ages it seems inevitable that the dry or cold environment which favors pastoral nomadism as a permanent occupation, should indirectly favor the perpetuation of relatively slender people with small, delicate hands and feet, whereas the more moderate environment which favors agriculture tends to preserve a sturdier, larger people, with big, strong hands.

How far the food of a people influences its physical characteristics and temperament is not yet certain. If food does have any such effect, it would seem as though this ought to be apparent when hunters are contrasted with pastoral people, or with others who are agricultural. At any rate, the food in the three cases is extremely diverse. The hunters eat meat as their main diet, although of course they gather such wild products as they are able. The pastoral nomad, whether he be Hottentot, Arab, Turkoman or Lapp, is by no means so great a meat-eater as is the hunter. People often make the mistake of thinking that because these people depend on animals, they eat meat all the time. That is not true. Of course meat is an important part of the diet, but only the rashest nomad kills the female animals so long as they are of any value as mothers. The young males can indeed be killed, but if the nomads would buy anything from the settled people, who alone are able to furnish them with grain, dates, cloth, iron and other manufactured goods, the young males must be sold. Therefore, so far as possible, practically all pastoral nomads depend upon milk. Among most pastoral people fresh milk is rarely used, and sometimes is considered nauseating. The regular rule is to put the milk into vessels in which there remains a little old milk, and there it promptly sours into the form sold in America under

various names such as leben, madzun, yowort. Among the Hottentots, however, contrary to the case among Arabs and even among the neighboring Bantus, the milk is drunk fresh, not being allowed to turn sour. Cows' milk is drunk by both sexes, but ewes' milk only by the women. In the old days, if cows' milk was scarce, the women were not permitted to use it, but were obliged to drink either ewes' milk or water. Practically all pastoral nomads make some form of butter and cheese. The butter soon becomes rancid, but the cheese is often kept a long time and is one of the main articles of diet when fresh milk becomes scarce. The poorer the pastoral nomads, the less meat he eats, but even among the rich, milk in one form or another, together with whatever vegetable products may be purchased in exchange for the young male animals, is the main food.

In addition to the milk and sometimes the flesh of cattle, the Hottentots who preserve the old habits use the flesh of animals which they hunt. Occasionally they kill buffalo, hippopotamus, antelope or other game. Hares and rabbits are also eaten by the women but not by the men, whereas the flesh of the mole as well as the pure blood of beasts is forbidden to the women, but not to the men. This sounds as though such Hottentots obtained a large part of their food from wild animals, but that is not the case, at least among the cattle keepers. They do indeed supplement their supplies by hunting, but they are only indifferent hunters compared with the Hottentots and Ba-Kalahari. Among them, perhaps, the art of hunting has not been important enough to act as a selective factor and give a material advantage to the good hunters.

Still another interesting result of the difference between the environments, and hence the social customs of the Hottentots and their neighbors, is seen in the form of government. Among cattle keepers, although the population is inevitably scanty, a

given area will support many more people than among hunters. Moreover, it is an advantage for several families to live together. The more the better, up to the point where the number of animals becomes so large that they eat off the grass near the camp with undue rapidity. Accordingly, like most people who follow the same mode of life, the Hottentots had a patriarchal system of government. Each tribe had its semi-hereditary chief and each camp its captain or patriarch. The chiefs and captains met in council whenever any great matters had to be decided, but for the most part each patriarch managed the affairs of his own little group, assisted perhaps by the older men. He settled all disputes regarding property, and punished criminals without consulting any outside authority. Theft, especially cattle stealing, was regarded as one of the worst crimes, just as was horse stealing on the American frontier in the days when the frontiersmen more or less adopted pastoral nomadism as their mode of life. The thief was bound hand and foot and left on the ground without food for a long time. If his offense were slight, he was beaten mildly with a stick before being released. If the offense was great, he was severely beaten and then banished from the corral. It should be noticed, however, that although theft was so severely punished when a man stole among his own people, the Hottentots, like practically all other nomads, had no scruples against stealing when they made raids on their neighbors. Among them, as among the Arabs, that was a recognized mode of getting a living. The moral code, like a large number of the personal habits and mental characteristics of the nomads, conformed to the requirements of the environment. The environment does not make a moral code, a human habit or a mental tendency. It merely weeds out codes, habits and tendencies if they sufficiently diminish the capacity of an individual or a community to survive.

CHAPTER V

LANDS THAT ARE TOO COOL

THE parts of the earth that are too cool for agriculture lie mainly in high latitudes but partly at high elevations. In both cases the results are essentially the same, and are much like those which occur where the climate is too dry. The essential point is that the indigenous culture, that is the occupations, habits and customs which grow up locally, must be adapted to conditions where animals furnish practically the only way of getting a living. The animals may be wild, in which case the people will resemble the Bushmen in many respects. But if there is grass enough for domestic animals, pastoral nomadism will take the place of hunting, and people like the Lapps and mountain Khirghiz will resemble the Arab, Hottentot, and Turkoman nomads of dry regions.

The gist of the whole thing is that peoples' occupations are the most powerful of all factors in determining their mode of life. Fishermen in all parts of the world, for example, as a rule resemble one another in their main habits, more than they resemble their near neighbors who are cattle raisers, farmers, merchants or miners. Aside from difficulties due to the cold climate, a Malay fisherman could probably get a living much more easily by fishing in the waters of Norway than by farming in the interior of Sumatra. A Hindu merchant, provided he could speak the language, would probably adapt himself more easily to a shop in Paris than to a mine in his own country.

In order to appreciate the resemblance between people whose geographic environment practically forbids them to practice

any mode of life except hunting or fishing, compare the Eskimos and other people of the far north and the Onas of the far south in Tierra del Fuego with the Bushmen of Kalahari. It is scarcely necessary to describe the Eskimos. Almost everyone knows that they live along the coasts of North America where they join the polar bear in moving from place to place according to the migrations of the seals. Sometimes they migrate in order to visit places where the birds are nesting in great abundance, or where fish can be easily procured; or perchance they travel a little inland, following the caribou or musk ox, but that is the exception, not the rule. Wherever they go the quest for wild animals is their main object, just as among the Bushmen. Of course the Eskimos in their moist, cold, Arctic environment dress warmly in thick furs, whereas the Bushmen in their dry, hot, subtropical environment often wear practically nothing. But the Bushmen as well as the Eskimos dress in skins, for in both cases that is the material which they can most easily procure. In like fashion, just as the Bushmen eat every sort of animal food on which they can lay their hands, and stuff it down half-cooked in vast quantities when it is abundant, so the Eskimos eat anything and everything in bad times. Then when they make a kill of seals or other game, they gorge themselves until they regurgitate, and even then keep on eating. One of the most characteristic pictures of the Eskimos which every explorer long retains is their shining, greasy faces as they stuff good fat blubber into their mouths and cut it off with knives wielded dangerously near their noses.

The hardness of the Eskimo and his ability to endure intense cold and prolonged hunger are paralleled by the ability of the Bushman to endure a degree of heat and thirst that would kill a civilized man. The Bushman's long hard chases after game and his ability to stalk an animal with almost infinite patience are paralleled by the tremendous efforts of the Eskimo

when he spends scores of hours paddling in his canoe in search of a seal, and by his patience in watching beside a hole in the wet ice while lying on his stomach. In the same way, the cleverness of the Eskimo in devising an oil lamp, a skin kayak and a harpoon, and in using bones and bits of driftwood to make his sledges, shows the same sort of ability as appears in the Bushman's preparation of poison for arrows and in the Ba-Kalahari method of sucking water out of the sand. Other resemblances appear in the ability of both races to endure days and weeks of hunger almost without complaint or apparent suffering, and in the lack of ability of either to withstand the diseases and luxuries of civilization. In both cases, a very severe geographical environment, which rules out all occupations except hunting, not only causes people to develop a culture whose aim is to train people in certain physical, mental and moral qualities, but in the course of many generations actually weeds out the families in which such traits are especially deficient.

Just as the Bushmen follow the agile antelopes, so the Eskimos follow the seemingly clumsy animals of the sea. Some summers the Eskimos are full of the zest of life, for each time they put forth among the floating ice in their skin kayaks, they come back with a seal or two or perchance a polar bear, for where the seals are there are the bears also. In such years almost everyone is well fed and happy. When the hunting season with its wanderings is over, each little group settles down in quiet for the long winter, assured that it will be well fed, well clothed and well protected from the nipping winds.

The same sort of thing occurs among other people regardless of the race to which they belong. In northern Canada, for example, the Eskimos sometimes come into contact with the Indians of the pine forests farther south. That is especially likely to happen when seals are scarce but musk ox and caribou

abundant. Large bands of these animals drift slowly from one region to another, and both the Eskimos and the Indians follow them persistently. They take their families with them, in order that as many animals as possible may be utilized, not only for food but for their skins which are of the utmost value for clothing and for tents during the biting days of winter. Far away in northern Siberia the annual migration of the wild reindeer is eagerly awaited in the same way, as the great event of the year, among such people as the Yukaghirs. If the animals are found in abundance, joy reigns universally, for the winter will be comfortable.

But now there comes a summer when the seals fail to appear in large numbers on the coast, the musk ox and caribou are scarce, even the rabbits farther south in the interior where the Indians dwell seem almost to vanish, and the reindeer in Siberia seem almost to have been exterminated. Then what happens? More than ever the hunters must be nomadic; they must travel hither and thither, searching for game of some sort. Some years it seems as if everything combined to produce disaster. The animals seem to be not only scarce but shy, and the fish are equally wary. To add to the general misery, the unusually wide wanderings of the tribes bring hostile people together so that one tribe clashes with another. In northern Canada the Indians may fight with the Eskimos; or in northern Siberia the Samoyedes with the Ostiaks. When winter comes, no one can settle down in peace, no food supply is laid away for the cold dark days, no blubber fat is ready to be burned; no fresh thick furs replace the worn garments of last year, and the old skins that form the walls of the huts must do duty again, even though they are full of holes. Then, more than ever, the hunting people of the cold regions must wander. They are sure to starve to death if they stay in one place; if they move elsewhere there is at least a chance that they may find something. The

wanderings and consequent exposure may kill many of the little children and old people, as well as some of the women and even a few men in the prime of life, but wander they must, for in no other way can they find food.

The Samoyedes of northern Siberia appear to afford an interesting example of the way in which a change in environment causes a change in civilization. According to Rodlov and others, the Samoyedes once lived much farther south than now, in the better part of Siberia, and were correspondingly more civilized. They were well acquainted with mining, for example, and sometimes dug shafts to a depth of fifty feet. They knew how to build furnaces wherein to melt copper, tin and gold; they manufactured weapons of hard bronze and made great pots, one of which weighs seventy-five pounds. Their polished decorations of bronze and gold testify to a high development of artistic feeling and industrial skill. They were not nomads, but husbandmen who practiced irrigation and built canals whose ruins can still be seen. They kept domestic animals, including a few horses, together with sheep and goats.

The Turkish invasion of southern Siberia in the fifth century of the Christian era enslaved part of the Samoyedes and drove others farther north. Those who live in the north today have degenerated to a very low stage of civilization. Along the lower course of the Ob they have no domestic animals and maintain themselves by hunting and fishing. They dress in skins, use implements of bone and stone, and eat carnivorous animals including the wolf. Instead of finely-made copper vessels, they use the crudest earthenware. Their huts resemble the stone huts of the Eskimos; their graves are mere boxes left in the tundra. Such a low stage of culture is almost essential because a higher stage can scarcely be maintained on such a slender environmental basis, but it by no means implies the absence of fine qualities. The Samoyedes, for example, are noted

for their honesty. They never take anything left by their neighbors in the tundra or near the huts. They are likewise described as independent and highly courageous. But neither these qualities nor almost any others can compensate for the repressive effect of an environment where even the herding of reindeer is beset with great difficulties, and men of every race are forced to become nomadic hunters if they would procure the means of life.

In the most southern of all inhabited lands the Onas of Tierra del Fuego differ widely from the Eskimos and Indians of Canada, and from the Samoyedes and Yukaghirs of Siberia, in race, language, and many other respects. Yet they have the same kind of environment, and therefore the same mode of life and the same habits in many respects. The guanaco, a wild relative of the llama of Peru, is their main reliance.

Like the Eskimos, the Onas wear no clothing except the skins of animals. Like the Bushmen they wear only a single garment, a guanaco cape thrown over the shoulders and clutched by the hand in front. They do not want to fasten it, for like the Hottentots they may at any moment desire to throw off their clothing in order to shoot an arrow. The women dress as simply as the men, and freely throw off their capes in order to plunge into the icy water and gather sea weed. Their neighbors, the Yaghans, go fishing quite naked in open canoes even when the water is full of ice. This is not very different from the habits of the Eskimos who sit in their huts almost naked, and think nothing of rushing out of doors unclothed to stop one of the frequent dog-fights, even though the thermometer is fifty below zero.

The people of cold regions who are able to keep domestic animals, differ from those who live by hunting in almost the same way that the Hottentots differ from the Bushmen. They have somewhat larger tents or huts, more equipment, a greater

variety of utensils and weapons than do the hunting folk. Since their mode of life provides greater material resources, they are able to purchase a greater abundance of articles from more civilized people. Nevertheless, nomadic people are always poor according to our standards. There are definite limits to the size of the herds which any one man can maintain, and no one can become what we would call rich. Moreover, no nomad can carry many goods and chattels with him, and practically all of what we call necessities as well as luxuries are out of the question.

The Lapps of northern Scandinavia illustrate the matter. James Thompson's description of them is still essentially true:

"The reindeer form their riches; these their tents,
Their robes, their beds and all their homely wealth
Supply; their wholesome fare and cheerful cups."

Not all of the Lapps, to be sure, depend upon reindeer, for many are fishermen, but they are poorer than the others. Even the mountain Lapps, who rely most fully upon reindeer, have learned to drink coffee and to wear stout Norwegian cloth. Nevertheless, their wealth is all in their reindeer. The extraordinary place which reindeer occupy in the lives of the Lapps is evident from the fact that the Lapp language contains more than three hundred native words connected with that animal. The deer supply practically all the food of their owners, for the Lapp diet consists mainly of reindeer milk and cheese in the summer and reindeer meat and cheese in the winter. Of course the Lapps, like other primitive hunters and nomads eat some green food in the shape of succulent plants that spring up for a brief season. Moreover, like others who keep domestic animals, they buy a little food from the settled people on the borders of their territory. Nevertheless, that often amounts to so little that the Lapps grow tired of their monotonous food.



PLATE VII. HAMILTON LOOKS OVER THE SNOW IN THE FOREST OF QUEBEC.

Very areas of small forest like this are too cold for agriculture and hence very sparsely populated. (Courtesy American Museum of Natural History.)



PLATE VIII. AN INDIAN BURIAL AT WRANGELL, ALASKA.

A region where low summer temperature still permits the forests to resist the encroachment of agriculture. (Courtesy American Museum of Natural History)

Their experiences suggest those of the Arabs who grow weary of "this vile milk" as Doughty vividly relates, and long for something that will really fill their stomachs. In the same way among the Khirghiz who migrate back and forth between the high plateaus and the dry steppe lands of central Asia, the children often beg for bits of bread as our pampered children beg for candy or ice cream.

Among the mountain Lapps the regular habit is to erect a small wooden storehouse raised above the ground on piles. In this, during the autumn, they store the cured meat of the surplus reindeer bulls. When winter sets in, they wander with their reindeer, making the storehouse their center, but taking the animals here and there where it is possible for them to paw through the snow and find dry grass and moss. As soon as the weather grows warm in the spring, the Lapps leave their storehouse in the low country and push up to the summer pastures among the mountains. That is the good time of the year, the time when the fawns follow their mothers, when milk is abundant, and great quantities of it can be converted into cheese for the winter.

In a certain way, the life of the Lapps with their reindeer is very different from that of the Khirghiz with their horses, yaks and sheep in the lowlands and high plateaus of central Asia. It differs still more from that of the Arabs with their camels and sheep in the dry desert, the Hottentots with their cattle on the borders of another dry desert, and the Peruvian Indians with their llamas in the high plateau of the Andes. Yet the differences are mostly external; all these people must perforce dwell in light, easily movable dwellings which can be taken down and packed onto animals in a few moments. All of them dress in the skins of their animals, or in garments woven from the wool or hair; all make their huts and tents of these same materials. All likewise use only the simplest utensils, cook

their meals much of the time over fires of dried dung; eat out of a common dish; store their milk in skins; and sleep on the ground on beds consisting merely of a layer or two of fur, skins or felts. All alike think mainly in terms of animals, so that their talk is as full of animals as that of a traveling salesman is of prices and bargains. Their form of government is almost universally patriarchal, for no other form is really practical. Education is extremely rare, and arts of all kinds are almost unknown save for a few simple processes connected with preparing milk, preserving skins, and weaving rough cloth.

The point of the whole matter, as we have already said, is that throughout the vast areas where the environment permits the rearing of domestic animals, but does not permit agriculture, mining, or any other mode of life except hunting and fishing, this same sort of nomadic life is almost certain to prevail. If the environment is still worse, so that hunting is the only possible mode of life, a still lower degree of culture prevails. In a few cases, to be sure, tribes which depend on hunting might improve their situation by keeping domestic animals. The Indians and Eskimos of northern Canada and Alaska, for example, might in some regions keep reindeer, or ovibos, as Stefansson suggests that we call the musk ox. In other cases, people who wander with their herds might settle down to a precarious type of agriculture. Such cases, however, are rare, and the change from one mode of life to the other is much more difficult than most people suppose. In fact, even where the environment seems to civilized people to be appropriate to a higher mode of life, the experience of the natives often proves that this is not the case. Thus as a rule, all over the globe the half of the lands where the population numbers less than one per square mile is inhabited by primitive people who remain primitive in large measure because their environment does not permit them to become more advanced.

CHAPTER VI

THE MARGINS OF CIVILIZATION

WHAT happens when the lands that are too dry or too cold for agriculture are penetrated by the white man? Will he succeed in spreading his civilization over them and in making them productive? He will doubtless succeed to a certain degree, but how far and how soon? In some far future, irrigation may enable the twelve million or more square miles where the climate is too dry for agriculture to support enough people to double the world's population. The regions that are too cold for agriculture may then harbor a vast industrial population which will exchange its manufactured goods for the food and raw materials of the reclaimed deserts. But all that, if ever it comes to pass, lies a long, long way in the future; we are concerned with the actual facts of today.

How rapidly is civilization taking possession of the cold and the dry lands with less than one inhabitant per square mile? The answer is summed up in the general principle that lands which fall below a certain degree of productivity are not yet wanted by civilized people. This does not include desert oases where agriculture affords a permanent and adequate basis for progress. We mean the cold or dry areas which cannot be cultivated. Throughout the twenty-five million square miles of such lands it seems to be an almost universal rule that highly civilized people are there mainly as intruders; only rarely as permanent settlers. The intruders come mainly as traders, miners, missionaries or officials. They often come without their wives and children, and their settlements lack the funda-

mental elements of permanence, no matter whether they are in Alaska, Siberia, Patagonia, central Australia, or the French Sahara.

Greenland furnishes a good illustration of a land that is too cold. During the four hundred years after Eric the Red explored the coast of that island between 982 and 985 A.D., and again during the last two centuries, the Norse and Danes have been free to settle there. Yet only in the rarest cases has an official, trader, or missionary been willing to let his wife stay any great length of time. Still more rarely have Danish parents wanted their children to remain permanently in Greenland. The children themselves have felt impelled to go elsewhere in search of careers. Greenland may temporarily attract a few active young people who are full of the spirit of adventure, curiosity or religious zeal, but it does not hold them. Even among the three hundred Danes who live there now, the percentage of women and children is small, and only a handful look upon Greenland as a permanent home.

This is typical of what happens in the less desirable parts of the world. A few people from more favored lands go there for special purposes. Those who go are generally of strong physique and of a more or less adventurous temperament. As long as they stay, they give to the small settlements in which they live an appearance of vigor and progress. But the more competent rarely remain all their lives, and still more rarely do they want their children to do so. If any are willing permanently to endure the uncultured, unattractive conditions which prevail among the sparse and untutored native populations, they generally revert toward the native culture. For example, during the fourteenth century communication between Norway and Greenland was interrupted and the Eskimos migrated into southern Greenland in large numbers, presumably because of

unusually snowy winters farther north. When Greenland was again discovered, no trace of the few thousand Norse who formerly lived there was found. Some were doubtless killed, but it is generally supposed that the remainder amalgamated with the Eskimos and completely lost their European civilization. However this may be, it is certain that since the re-discovery of Greenland by Europe, two centuries of contact with the Danes have not appreciably changed the Eskimo mode of life. The main reason seems to be that even such highly advanced people as the Danes have not succeeded in introducing new occupations, or any essentially new methods of conducting the old occupations. In a land like Greenland, the geographic environment makes it extremely difficult to do this except where mineral resources are found.

Scandinavia furnishes a still more convincing example along this same line. Ever since the dawn of history, the scanty nomadic population of Lapland has been in contact with the rapidly advancing civilization of Norway, Sweden and Finland. If ever the conditions have been favorable for the spread of high civilization into the cold parts of the world, it has certainly been there. But what has happened? The Norse do indeed conduct summer excursions to the Land of the Midnight Sun; the Swedes have opened iron mines on the borders of Lapp territory; and the Lapps have been provided with a few manufactured articles such as knives, cloth and the like. But how far does the Scandinavian culture prevail in Lapland, and how far have the Lapps changed their mode of life? Scarcely at all. The average Swede, Norwegian, or Finn can make a far better living and find life far more comfortable and enjoyable in his own region than he could by going a few hundred miles north into Lapland. Not only are the conditions of life unpleasant in Lapland, but a given amount of energy and thrift applied to the limited resources of that region will not yield nearly so large a

return as when applied to the better resources where the climate is more favorable. That is one of the great secrets of the backward civilization of the entire half of the lands where the population is less than one per square mile. When people have once risen to a relatively high standard of living, the rewards of human effort in the less favored parts of the earth are not great enough to attract them.

Alaska is a case of the same kind. For two generations the people of the United States have been urged to settle there. They have been told about the coal, gold and other mineral resources, the vast supplies of timber, the wonderful possibilities for fishing and fur raising. They have been officially informed that something like a hundred thousand square miles of land are fit for tillage or pasturage. Yet the white population has increased only from about ten thousand when Alaska was purchased by the United States in 1867 to 27,900 in 1920. Only one in four of the white population is a girl or woman, and the entire number of married women is only 3,920. By far the larger number of the families with children are in the southern part of Alaska, the only portion where the population rises to a density of a quarter of a person per square mile. That is the only portion where there seems as yet to be much assurance that a permanent white population will ever take root. There the children under ten years of age form twenty-three per cent of the white population in contrast to only fourteen per cent in the northern half. In a normal state like Michigan, such children form twenty-six per cent.

The present tendency among the fifty-five thousand people who inhabit Alaska is illustrated by the fact that both the whites and the Indians have declined since 1900. The most significant feature is illustrated in the following table which shows the number of whites and Indians respectively in 1920 for every hundred of the same race in 1910. The figures are

arranged according to the four judicial districts, the most southerly district being labelled A, the next B, and so on.

	<i>Whites in 1920 per 100 Whites in 1910</i>	<i>Indians in 1920 per 100 Indians in 1910</i>
District A (South)	134	91
District B	81	98
District C	48	107
District D (North)	36	121

This means that although the white population is increasing in the south, it is rapidly leaving the north. The Indians on the contrary, are doing exactly the opposite. Unless the census is in error they are leaving the south, or possibly dying out there, and are migrating northward or perhaps increasing rapidly through excess of births over deaths. The immediate cause of this is the exhaustion of mines and the unusual condition induced by the World War. But this does not account for the opposite tendencies among the intrusive white men and the native Indians respectively. It does not explain the curious way in which the two types of civilization are pulling apart, temporarily at least. If this continues, the slight veneer of European culture which has come to the Indians is likely to become thinner and thinner, while the few white men who stay in the north are more and more likely to adopt a mode of life resembling that of the Indians. That they are doing this is evident from the fact that a goodly percentage of the seventeen hundred whites who remained in the northern judicial district in 1920 were hunters, guides, trappers and fishermen, the rest being predominantly miners. In this respect they are like the Indians, among whom hunters, guides and trappers form nearly half of those whose occupations are listed by the census, while fishermen form more than a quarter.

All over Alaska the occupations of the white men are quite different from those of corresponding people at home, and resemble those of the Indians. This is evident in the following figures which show the approximate number of men engaged in each occupation for every man who would be so engaged if the percentages in the various occupations were the same as in the entire United States.

<i>Occupation</i>	<i>Whites</i>	<i>Indians</i>
Farming08	.01
Trade5	.1
Mining and Mechanical Pursuits5	.3
Clerical Work5	.06
Stock raising	1.0	7.6 (Reindeer herders)
Professions	1.0	.2
Domestic and Personal Service	1.4	.4
Transportation	1.5	.2
Public Service	3.1	.2
Lumbering	3.5	2.8
Fishing	5.3	14.0
Mining	11.8	1.4
Hunting, guiding, etc.....	66.7	2,005.0

Among the white men farming amounts to almost nothing. Only about half as many men proportionally are engaged in trade, in manufacturing and mechanical pursuits, or in clerical work as in the United States as a whole. Stock-raisers and professional men show about the normal proportion, although three-fourths of the stock-raisers are reindeer keepers instead of dairy-men. Personal service and transportation require nearly a half more white men there than here, but this is largely because the Indians take little part in these pursuits. When it comes to public service, the demand for men in Alaska is relatively three times as great as at home; even if the Indians are

taken into account, it remains twice as great. The occupations which are especially characteristic of Alaska are lumbering, fishing, mining and hunting, which take anywhere from three and a half to sixty-seven times as many persons proportionally as in the main United States. Among the Indians these same occupations are likewise important, except that the place of mining is taken by reindeer herding. In other words, the white man in Alaska largely gives up the pursuits which most fully occupy him in more favorable climates, and turns especially to four occupations which are peculiarly adapted to sparsely populated countries, but none of which tends to produce a permanent progressive civilization.

But how about parts of the world where there is no native population? Will not European civilization spread into them? Iceland illustrates what happens in the cool, wet regions; the Near East, Australia and Nevada in the dry. A thousand years ago Iceland had only recently been discovered and was practically uninhabited, but between 880 and 930 A.D. perhaps fifty thousand Norse migrated thither. These migrants contained an astonishingly high percentage of the upper classes, mainly chiefs who would not endure the kingship and the taxes imposed by Harold Fairhair, the first Norwegian king. Taking the best of their retainers, these proud Norse either made Viking raids, or if more peaceably inclined, went to Iceland.

After the first migration, practically no new settlers came for a thousand years. During that period the Icelanders performed one of the greatest feats in all history. Although never numbering more than a hundred thousand, they produced a literature which, according to many of the best authorities such as Lord Bryce, former British Ambassador in America, has never been surpassed by any primitive literature except that of Greece. But they did far more than this. They established a free representative government which secured uncommonly

good results with a minimum of machinery. They likewise maintained a high degree of culture. Sometimes, to be sure, the people nearly starved, and culture flickered almost to the point of expiring. Each time, however, they recovered. During the last three centuries the Icelanders, in proportion to their numbers, have produced more eminent men who are mentioned in the *Encyclopedia Britannica* than have the people of any other country outside England and Scotland. Moreover, in our own day, Iceland still maintains a highly creditable university and all sorts of scientific and philanthropic institutions. It has kept pace with the most advanced countries in improving its laws, health, industries and education.

Does all this seem to be in direct contradiction to our statements as to the failure of the higher civilizations to occupy the poorer lands of the world? Not at all. The inhabited part of Iceland is limited to a narrow fringe, mainly on the southern border but with a few outliers in the form of little fishing stations in the north. A considerable area of Iceland might be utilized by people who were willing to live as the Lapps and Eskimos live. The Icelanders, however, have never been willing to do this. Without consciously framing the matter they have refused to give up a standard of civilization which involves permanent homes, books, schools, churches and a settled form of government. Therefore, although the Icelanders depend upon animals as fully as do nomads like the Lapps, they inhabit only a small part of their island. The winters in that part are no more severe than in New England; the summers, although too cool for agriculture, are warm enough and long enough so that grass grows with extraordinary luxuriance. Without being absent from their homes more than a few weeks in the summer, the Icelanders can pasture their sheep and other animals and can lay by great stores of hay to feed them through the winter. They can likewise engage in fishing, wandering far

and wide over the waters, but returning to permanent homes. Wherever it is impossible thus to maintain permanent homes, the Icelanders leave the land unused. That is why a large part of Iceland is today practically uninhabited. The secret of the whole matter seems to lie in the fact that when the resources fall below a certain level, the standards of civilized life cannot be maintained. Therefore civilized people either avoid such places as permanent homes, or decline toward the level of the native populations. The discovery of new methods and resources will doubtless change the limits beyond which civilization tends to decline, but that will not change the great geographic principle.

Turn now to the dry regions where agriculture is impossible. They differ from the cold areas because they are less uniformly uninhabitable, being spotted with oases or traversed by rivers or mountains where the presence of water fosters abundant vegetation. Moreover, by means of wells, reservoirs, canals and the like, human ingenuity is able to overcome the climatic conditions to a much greater extent than in the cold regions. Nevertheless, in the Near East where civilization has been longest established, it has practically never spread out into the real desert. Within sight of the fertile lands of Egypt, which have been cultivated for six thousand years, the people of the desert live practically as they have always lived since the camel and horse were domesticated. In Palestine even today one has only to go from Jerusalem a few miles into the dry wilderness of Judea or the Dead Sea valley to come upon Arabs who pursue the habits of their fathers practically uninfluenced by the Assyrians, Syrians, Jews, Egyptians, Romans, Nabateans, Saracens, Turks and British who have successively ruled the land. Many of the desert people, to be sure, migrate into the better watered lands, and there acquire a new type of civilization. A few from the better watered lands are sometimes

forced into the desert, but they leave their civilization behind them and soon become like the desert wanderers.

The same thing is true in the great deserts of Arabia, Trans-Caspia, Turkestan, Gobi and Mongolia, and in the smaller desert tracts of Persia, Baluchistan and northwestern India. Even in the Kalahari the life of the Hottentots who have suddenly been brought into contact with highly civilized Dutch and English settlers has not been essentially modified so long as the Hottentots stay in their old environment. The cultivated areas have been increased in size by means of irrigation, and new supplies of water for cattle have been procured by digging wells. Moreover, certain habits pertaining to dress, implements, food and the like, have been somewhat altered. But among the Hottentots who remain in the old environment, the essential customs pertaining to getting a living have been altered only a little. Nor have the people of the higher civilization penetrated into the desert to any great degree. The lands too dry for agriculture, like those that are too cold, offer little temptation to permanent settlement on the part of the white man, provided there are nomads there who will use the grass for flocks and herds and let him make a profit by buying and selling.

But how about regions like Australia and the southwestern United States where the white man found dry regions whose millions of acres of grass were wasted because the native inhabitants had no domestic animals? Do those not prove that European civilization will spread into even the driest parts of the earth? The answer is yes, in certain respects, but this does not contradict the principles that we have just laid down. In Australia, for example, white men have carried the highest type of culture out into the driest desert where there is less than ten inches of rain per year.

They have done this partly by opening mines, but mining is

a local industry, highly specialized and relatively temporary, and need not detain us here. The main way in which the white man has attempted to conquer the Australian desert is by imitating the more primitive pastoral people and raising cattle, sheep, horses and even camels. At first he seemed to do this and still retain his old type of civilization. Here and there throughout a million square miles of the dry parts of Australia one could formerly find homes where the latest books were read and appreciated, where the children were sent far away to be educated, and where the hospitality was as delightful as in any place in the world. That is what often happens when a high civilization has attained success after a sudden vigorous onslaught on the desert or any other unfavorable new environment.

But what comes next? Today, the great stations, as the Australian sheep ranches are called, are being broken up. The government has decided that no one man shall hold enough land to yield him a fortune, but that a larger number shall have enough to yield to each a comfortable living. In the drier parts, the ideal now is not a millon, or even a hundred thousand acres as was common in the past, but ten or twenty thousand. The day of the old, free-handed, cultured and adventurous settler in the desert is gone; the older men of that kind are dying out or have moved to the cities; the profits from cattle and sheep are not what they once were, and the children are rarely willing to stay in the old homes.

It is easy to say that all this is due to the government, but the government has merely hastened what was bound to happen anyway. The type of white man who is content to live in the drier regions tends slowly but surely to decline. Driven wells, automobiles, mowing machines, and other appliances do indeed make it possible for the white man to raise animals in desert regions without being a nomad. A similar change may

some day occur even in places like Arabia where a nomadic population is well established. But even where the white man has things almost wholly to himself, there are vast tracts — one or two million square miles in Australia — where practically no one yet lives, wants to live, or is likely to live until the earth is far more crowded than is yet the case. But the most significant thing is that after the cream has once been skimmed and the newness worn off, the most competent types of people are rarely willing to get a living permanently by means of the desert resources.

Why should they? The summer heat is scorching; fierce winds often fill the air with blinding dust; and the flies are a constant nuisance. Even though they may be kept out of the house by means of screens, they cannot be driven away out of doors so long as animals are kept. Far worse than this is the fact that the children in such places can only be sent to school with the greatest difficulty; and social contacts are few and unsatisfactory. Men of the finer types feel unwilling to have their wives and children subjected to such conditions. The result is that little by little the drier parts of Australia are deteriorating. How far this process will go no one can tell, but it seems quite clear that after a few generations the people who remain will be different from those who have gone away, and will have a lower civilization. The tendency of the desert is like that of the cold lands. It attracts people when wealth can rapidly be acquired, but after a while the more active people, the leaders, tend to go back to regions of higher civilization, and progress is followed by retrogression.

This conclusion seems to be verified by the driest parts of the United States. Nevada is the state where aridity makes agriculture least feasible; although compared with the world's really great deserts, it is highly favored. Now it so happens that among the forty-eight states of the Union, none displays

so many peculiar features according to the Census, and most of the peculiarities are directly or indirectly due to aridity. The first peculiarity is the extremely low density of population, only .7 of a person per square mile, or about a third as many as in Wyoming, which comes next in this respect. But low as the population is, it fell off more than five per cent between 1910 and 1920. Vermont and Mississippi also lost a little, but not at nearly so great a rate. Another peculiar feature is that the number of men compared with women is far larger than in any other state. This is especially true in the rural sections where there are a hundred and fifty-six males per hundred females. If children are omitted, the discrepancy becomes even greater. In 1920 there were actually about two hundred and forty men and boys over fifteen years of age for every hundred women and girls. Such a ratio means that unsettled frontier conditions still prevail far more than in neighboring states. Men come for a little while without any intention of establishing homes, so that the population contains an extraordinarily large percentage of men between the ages of twenty and forty-five. Such a condition is, of course, very bad socially. Perhaps it has something to do with the fact that the laws of Nevada permit Reno to be the great divorce mill of the United States. It certainly explains why that town has at various times achieved an uncommonly bad reputation for organized vice.

Of course this is largely because Nevada has a larger percentage of miners than any other state, over a fifth of the men being engaged in that occupation. But Nevada is not a really great producer of minerals; half of the states excel it in the value of their mineral products. Nevada merely seems to be a great producer because it has at one time or another had some very famous mines, and its other products are relatively negligible. No, the real fact of the matter is that because it is so dry nobody wants the land for much of anything except mining,

and of course the percentage of vagrant miners is bound to be high. If Nevada were as moist as Virginia its miners would scarcely be noticed, and its social problems would be correspondingly different.

Another interesting result of the fact that the white man does not want the land of Nevada is found in the fact that among all the states there is none except Arizona where the proportion of Indians is so high. In the driest parts of these states the primitive civilization of pre-Columbian days more nearly holds its own than anywhere else in the United States.

The fact that nearly twenty-two per cent of the men of Nevada are miners is no more peculiar than is the fact that eleven and a half per cent are engaged in transportation. No other state except Idaho has so large a percentage. This is natural, for where the population is sparse the distances from one center to another are great, and the amount of work devoted merely to getting one's self and one's goods from place to place becomes excessive. That is another of the handicaps of a sparse population. If left to itself, however, Nevada might let its transportation sink to a relatively low level because of lack of funds. As a matter of fact, a large percentage of the men engaged in transportation are employed upon transcontinental railways. They are in Nevada not because that state maintains them, but because great trans-continental railroads have to cross the state to reach California and the coast.

Another peculiar feature of Nevada is that scarcely twenty per cent of the men are engaged in agriculture, a smaller percentage than in any other part of the country except the Middle Atlantic States and New England. In those states, the percentage is low, not because there are so few farms but because such vast numbers of people are engaged in manufacturing. In Nevada, on the contrary, it is low because there is so little land that can be cultivated, or where cattle can be raised without



PLATE IX A YARD IN ALASKA.

Feeding a two-year-old and a yearling deer at Wrangell, a northern outpost of white civilization. (Courtesy American Museum of Natural History.)



PLATE X. SHEEP RAISING ON THE COCONINO NATIONAL FOREST IN ARIZONA.

One of the white man's outposts in a dry region. The herders who care for the sheep live much as do the primitive shepherds in Asia. (Courtesy U. S. Dept. of Agriculture.)

resorting to a genuinely nomadic mode of life. Such farms as can survive are very large, averaging seven hundred and forty-five acres, which is more than in any states except Wyoming and New Mexico. If only the improved acreage is included, their average of one hundred and eighty-eight acres is exceeded only in North and South Dakota. No less than ninety-four per cent of all the improved lands are irrigated, which shows how dry Nevada really is.

The way in which this land is used illustrates the civilized substitute for the nomadism of more backward people. Most of the farms are cattle centers. The animals are pastured on the outlying dry land, but when the pasturage there is exhausted, the owners do not migrate elsewhere like the Arabs. They simply feed their animals with hay. In order to have enough hay nearly sixty per cent of all the improved land, and no less than ninety per cent of all the land for which crops are reported, is devoted to raising hay and forage. No other state raises so much hay proportionally, and nowhere else is the number of cattle, sheep, horses, mules and burros so large per farm. Think what it means when the average farm has twelve hundred sheep, one hundred and thirteen cattle, and seventeen horses! Naturally, the price of these animals is almost the lowest in the country, for prices normally fall when the quantity of any product is great in proportion to the number of people who want it.

Although these large figures sound as though agriculture were highly important only 0.8 per cent of the whole state of Nevada consists of improved land, whereas in Iowa the figure is 85.5. Yet even this small figure shows a decline, for Nevada was the only state aside from New England, New York and New Jersey where the amount of land in the farms, and even the amount of improved land, declined from 1909 to 1919. Astonishing as it may seem, the improved land actually fell off

more than twenty per cent. Here we have an illustration of what we often find in the less favorable lands. At the first rush of settlement, all the available land may be occupied more or less completely. As time goes on, people find that they cannot make a good living under such a stern environment. Therefore little by little they give up the poorer portions of the land, the less profitable mines, the less traveled railroads. In Nevada few ranches are still running except those where irrigation makes it possible to raise hay for cattle which pasture on surrounding tracts that are unwatered.

With this goes the fact that in Nevada a larger percentage of the farms are run by managers than in any other state in the country. The number thus operated is only five per cent to be sure, but even that is very significant. It shows that the owners of the better farms tend more than in any other state to go away. People who succeed well enough to live elsewhere do not like to stay on the Nevada farms any more than on the great sheep and cattle stations in Australia. Another notable thing in this connection is that the proportion of tenants, only nine per cent, is less than in any other state. Most of the farms are not profitable enough to support both a landlord and a tenant, nor are they desirable enough to attract tenants when abandoned by their owners. This illustrates the almost universal rule that the more desirable the land the greater the percentage of tenants.

All these facts from the Census form an extremely interesting picture. Take from Nevada the people who get a living from some source other than the ninety-nine per cent of the soil which is unwatered, and who remain? The twenty-two per cent of the population who depend on mining are gone — so are the eleven or twelve per cent engaged in transportation, the twenty per cent more or less who run farms where irrigation is practiced, and the merchants, artisans, servants, pro-

fessional men and others who get their living by caring for the wants of the groups first mentioned. There remains in Nevada almost no one except a small and growingly impoverished group of cattle-raisers who live on isolated ranches where there is not enough water to raise hay for the animals. Little by little the more energetic and ambitious people on such ranches are moving away, while the rest tend to go downhill. Their children cannot go to school; there are no amusements for either parents or children; good roads cannot be built because of the great distances and the prohibitive expense. The more energetic among the children hate such conditions, and hurry to the towns as soon as they are old enough. Thus even in the United States an environment too dry for agriculture, and where no other factors, such as mines and railroads, bring other modes of life, promotes a tendency to revert to a low stage of civilization. All over the world the lands too dry for agriculture, as well as those that are too cold, seem to be unfavorable to any appreciable advance in human culture. Even when a high civilization is introduced into such regions, it tends to decline. That tendency is likely to continue until some new invention or discovery introduces a new mode of getting a living.

CHAPTER VII

TOO WARM AND MOIST

THE tropical and semi-tropical parts of the world may be divided into three great types. The first comprises the two million or more square miles where there are practically no inhabitants. The second comprises another eight million square miles or so where the population ranges from one to a hundred per square mile. The third consists of the relatively small, but extremely populous areas where the density averages above one hundred. Many people seem to think that the inhabitants of all these regions can be lumped together as inefficient, backward and uncivilized. That is a great mistake. The differences between the most primitive tropical people, such as the wilder Hill tribes of India, and the most advanced, such as the Parsis, are enormously greater than the differences between the most advanced tropical people and ourselves.

The most primitive tropical people are generally savages who live in the equatorial rain forests where the population is scarcely more than one per square mile. They include such types as the pigmies of Africa, the Negritos of the East Indies, and the Indians of the Amazon Basin. Such people wear almost no clothing; they live in tiny shelters of branches and leaves which often are placed among the trees; they hunt with the most primitive implements such as poisoned arrows. Even in our day they are so poor and have so little contact with the outside world that iron tools are rare, and stone implements are still employed. Organized government is almost unknown, while religion is often so undeveloped that only by patient re-

search has its presence been detected. Among such people cannibalism, witchcraft, and similar savage customs prevail even to this day.

The resemblances of such people to the Bushmen of the Kalahari, the Onas of Tierra del Fuego, and the Eskimos of the north are readily apparent. All of these primitive groups live in a low stage of culture because they have never been able to overcome the many handicaps of their environment. But does the warm moist climate and luxuriant vegetation of the Amazon Basin, equatorial Africa, and the interior of Borneo and New Guinea offer handicaps at all like those of Arctic regions and deserts? Is it not the ease of life rather than the difficulty which holds people back? Or if there are difficulties, are they not due to disease and physical inertia rather than to the impossibility of agriculture?

One of the most common complaints of outsiders who go to the more primitive tropical regions is the lack of variety in the food. Here is the way Commander Todd of the United States Navy reports the matter: "The crying need of the Amazon Valley is food for the people. . . . At the small towns along the rivers it is nearly impossible to obtain beef, vegetables or fruit of any sort, and the inhabitants depend largely upon river fish, manioc and canned goods for their subsistence." But the people here referred to are mainly foreigners, or those who depend upon foreign methods. Out in the great forest the natives themselves generally have no grain or vegetables whatever, aside from the manioc root. In spite of the common supposition to the contrary, they rarely get fruit and nuts from the trees which form a dense canopy far above them; nor is it possible to raise domestic animals. Almost their only source of livelihood is such game as they can bring down, a little manioc, and such other edible herbs, fruits and nuts as they can pick up in the forest. Even if they were not terribly handicapped by

the damp heat and the virulent diseases, it is doubtful whether they could cultivate the soil. It is too thoroughly leached and water-logged; useful plants run to stem and leaf rather than seed, and are choked by weeds with amazing rapidity.

Although people of this most primitive forest sort occupy a considerable area, they form only a small percentage of the inhabitants of the tropics. A vastly more important group comprises those who dwell where jungle rather than dense rain forest prevails, and who practice what may be called hoe and tree culture. Such people drop the seed into holes punched with a stick, and grub up the weeds with a hoe, but do not employ animals to plow or cultivate the soil. They are found in practically all parts of the tropics aside from the most sparsely populated regions and those of dense population where rice culture almost invariably prevails. They form almost the whole of the eighty-five million in Africa between the dry Sudan on the north and the Kalahari on the south. They likewise comprise a large fraction, possibly a quarter, of the three hundred million of India. In the East Indies and Indo-China perhaps fifteen million of them live outside the rice areas, while in America from central Mexico southward well toward the southern side of Brazil, the majority of the sixty-five million inhabitants are of this same type.

The degree of progress among the two or three hundred million tropical people who practice hoe culture varies greatly. The most primitive generally occupy the regions where the rainfall is heaviest, or most constant throughout the year, and where the jungle is consequently most dense. They ordinarily live in rough, pointed huts with heavy thatches of palm leaves or similar material, and with flimsy walls of sticks. Around their huts they usually have a few fruit trees, especially cocoanut palms and bananas. Their fields consist of almost inconceivably weedy patches of yams, cassavas, pumpkins,

millet or Indian corn. Often a field is cultivated only one or two years and then abandoned in favor of another which has been freshly cleared and burned.

Above this lowest type of agriculture a whole series of higher types is found. Where the jungle is less dense, trees and roots more and more give place to millet and Indian corn, and the stage of culture gradually rises. These cereal crops require at least a certain degree of regular cultivation, and thus are a great help toward civilization. In still higher stages tropical agriculture branches along two lines, both of which were probably introduced from regions beyond the tropics. One of these is rice culture which we shall discuss in the next chapter, and the other plantation agriculture, which is a relatively new venture whose effects on civilization cannot yet be fully estimated.

Tropical agriculture and transportation are generally confronted by difficulties greater than those experienced in middle latitudes. One of the greatest difficulties is the soil. Fresh volcanic soil, such as that of Java and Martinique is as good in the tropics as anywhere else, but unfortunately it is scarce. Most parts of the vast area within the tropics suffer as we have seen, because the soils are so highly weathered and thoroughly leached that they have lost much of their plant food. They may form the red material known as laterite, the dregs of a soil after the good parts have been carried off. Even where laterite does not prevail, decay occurs so rapidly that the soil lacks humus, and is poor in nitrates, as well as in other essential constituents. Elsewhere, as in vast sections of the Amazon Basin and the low plains along the coast of New Guinea, the soil is water-logged so that it does not have a chance to become aerated and productive. The heavier the rainfall and the more even its seasonal distribution, the worse this handicap.

Another great hindrance to tropical agriculture is the vast

number of fungi, insects, birds and beasts which devour the crops or otherwise destroy them. Even in temperate countries the farmer is often in bad straits because of wheat rust, potato blight, cut worms, potato bugs, squash bugs, currant worms, and tent caterpillars. In some places, such as parts of New England, he is also seriously hampered by crows and deer which eat his corn, and by rabbits, raccoons and woodchucks which destroy his vegetables. In lower latitudes leaf blight, root rot, hoppers and boll weevils do hundreds of millions of dollars worth of damage to the cotton fields, while the San José scale is a terrible pest to the orange raisers. As the tropics are entered, the pests become more numerous and destructive, until they become well nigh unconquerable unless a very high type of agriculture is introduced.

The people of cooler climates rarely appreciate the difficulty imposed upon the tropical farmer by the rapid growth of vegetation. Of course the crops develop with marvelous speed, but the weeds grow still faster. Anyone who has struggled with a garden knows that in dry weather it is easy enough to root up the young weeds and let the sun kill them. In wet weather, however, not only is it difficult to manipulate the damp, sticky soil, but even when the weeds are dug up, they take root again at once. In order to keep them down, the tropical farmer who practices ordinary hoe culture must work far harder than the farmer of cooler regions.

This fact, together with the poverty of the soil and its tendency to become sour or otherwise unfit through the accumulation of bacteria, accounts for a common but seemingly wasteful method in large parts of tropical America, Burma, Indo-China, the East Indies and equatorial Africa. That method is to cultivate a field a year or two and then abandon it. The first crop may be good, but the second is much less abundant and the third may be scarcely worth harvesting.

Even if the slight supplies of soluble plant food are not exhausted and if the soil still remains sweet, the fields may be completely clogged by grass. In the Philippines when cogon grass six feet high gets into a field, the roots often form so tough a mat that the weak native oxen with primitive plows cannot plow it. In Guatemala the weeds sometimes grow so fast that the corn crop is practically smothered. Or perchance, when a new field is being prepared, the nominally dry season is so rainy that after the trees and bushes have been felled they do not become dry enough for burning before the genuine rainy season comes again. When that is over, so much new wood has grown that the work of clearing the land must be done all over again.

Even if conditions are not so bad as all this, it requires a high degree of persistence, energy and intelligence to overcome the handicaps of poor soil, bacterial diseases, insect pests and weeds on a tropical farm. A corn crop of fifty bushels an acre can be raised by almost any farmer in central Illinois, but a crop of that size on the borders of the Amazon or Congo valleys would be a remarkable example of human energy. All this is one of the reasons why the standards of tropical living are so low.

Even when the tropical farmer has raised his crops, he has more difficulty in preserving them than does the farmer in cooler lands. One reason for this is the nature of the crops themselves. Bananas will not keep like apples; corn and millet spoil more quickly than wheat; and cassava roots and yams cannot be kept so easily as potatoes. Another difficulty in storing tropical crops is the nature and abundance of the insects and animals that attack them. It is very difficult, for example, to make storehouses which are proof against the all-devouring termite, while thatched roofs which are needed to shed the rain are a great resort for mice and other little rodents.

Moulds and other fungi likewise develop very rapidly in the moist warm air which prevails so steadily in many parts of the tropics. Most people in the northern United States know how difficult it is to keep food and other products in the damp dog-days of August. If a few days of such weather produce such an effect, think what must happen when the dog-days continue for months.

The problem of draught animals is especially serious for the tropical farmer. The rapid and rank growth of vegetation makes strong work animals especially necessary in order to plow land beset with large weeds or grasses. Unfortunately, aside from the water buffalo, such animals do not thrive in the majority of tropical countries. Ordinary European cattle, and especially horses with their delicate skins, rapidly deteriorate in tropical countries unless given extreme care. One reason for this is that every animal has what is known as its optimum climate, and cannot live beyond certain climatic limits. The optimum means the condition under which the animal's health and vigor are greatest; the farther the climate departs from this, the more susceptible the animal becomes to disease.

Unfortunately, the causes of disease are especially numerous in warm countries. One such cause is the vegetation. Many tropical grasses are too coarse and stiff for the tender mouths of European cattle and horses. Others are so rank and watery that they derange the digestion. In addition to this, insect pests are especially abundant. The tsetse fly of Africa is so fatal to horses and cattle that it excludes them from millions of square miles in central Africa. Ticks are almost as bad in other places. Even if the insects are not so poisonous as the tsetse, the stings of flies, ticks, mosquitoes and the like often irritate horses to the point of frenzy. That diminishes their strength, increases their susceptibility to disease, and shortens their lives. The water buffalo, or caribao as it is

called in the Philippines, is indeed free from most of these difficulties. Its optimum climate is warm and moist. Its digestive system is adapted to coarse, watery vegetation, and its thick hide, plus the coat of mud with which it loves to encase itself, make it fairly immune to insects. But unfortunately the water buffalo is not adapted for the cultivation of dry crops, being useful mainly for wet crops like rice. For other kinds of agriculture, the native humped cattle of India and the allied bateng of Java are the best available, but they are relatively small, inefficient and unintelligent compared with the horse. Moreover they are not immune to creatures like the tsetse fly.

The handicaps arising from the difficulties of agriculture are increased by those of transportation. Even if everything else were the same, it is probable that the moister tropical countries would have harder work to maintain good transportation than would the countries that are cooler. One reason for this is the rapid deterioration of roads because the warm dampness causes any material used for hard roads to weather and decompose, but this is not so bad as the frost farther north. A much worse trouble is the rapid growth of vegetation which in many tropical countries makes it difficult to keep ordinary roads and trails open unless the population is dense. In much of Africa there are not even trails, let alone roads, through hundreds of thousands of square miles of tropical forest. In a region like Yucatan, after the gatherers of chiclee sap for chewing gum have been through a forest and tapped all the available trees, the trails which they make disappear almost overnight. Not only do new bushes and trees grow up from below, but lianas drop down from above and effectually close the paths. If a road or trail is kept free from vegetation it usually suffers from torrential rains which, as a rule, are much heavier than in higher latitudes. Where the trails lie on slopes, the rains convert them into rocky ruts extremely difficult to traverse; where they are

more level, the rains give rise to seas of mud. These difficulties are of the same kind as those in other parts of the world, the only difference being in degree.

Transportation suffers even more than agriculture by reason of the poor quality of the domestic animals. A place like the Khirghiz steppes or the prairies of Iowa, where the horse thrives almost without attention, has an enormous advantage over a place where horses can be kept alive only with the greatest difficulty. Even mules do not thrive in the moist tropics, for the donkeys which are their paternal ancestors are best adapted to climates drier than those where the horse is at his best. If civilization in a tropical region advances to the point where wheeled vehicles and finally motor vehicles are used, the difficulties still continue. Not only do the rains tear the roads to pieces, but all sorts of tools and machinery rust very rapidly.

Some people may say that these difficulties are no greater than those imposed by snow in higher latitudes. But until the automobile was invented, snow was a great help in many regions. The Indian waited until winter to make his longest journeys because it is so easy to travel over the snow on snowshoes. The New England farmer thought it a waste of energy to haul his winter's wood except when the snow made it possible to use sledges. Not till civilization had reached a very high stage and people were easily able to cope with it, did snow become the nuisance which it now is in cities and wherever motor traffic is the rule.

All this does not mean that the difficulties of tropical agriculture and transportation are insuperable. It merely means that they are more discouraging than those of the temperate zone. Progress in civilization demands that people raise a variety of foods and raw materials, and accumulate a surplus on which to live while making new discoveries and taking new

steps in advance. It also demands that people be able easily to travel about so as to get ideas and materials from other places. All this is more difficult in tropical than in temperate lands. Moreover the incentive to do so is less than in cooler countries. Not only is there less need of clothing, shelter and fire, but the absence of strong seasonal contrasts removes one of the greatest of all stimuli to activity.

The necessity to hustle around and lay in supplies of food, fuel, and clothing before the arrival of cold weather is an extremely powerful stimulant to both physical and mental activity. It is likewise one of the most potent of all factors in weeding out the kind of people who are too stupid or lazy or shiftless to provide for their children during the winter. Within the tropics, on the contrary, although it is difficult to provide much of a surplus where hoe and tree culture are the modes of getting a living, it is relatively easy to pick up a hand to mouth living from day to day. Thus in tropical lands the lazy, indolent type of man has been able to live and to support a family almost as well as has the one who is more industrious. In fact, although the matter has never been adequately tested, the man who exerts himself relatively little may possibly have a better chance of preservation than has the one who exerts himself strenuously. It has been abundantly demonstrated that in warm, moist air, a given degree of exertion raises the body temperature and leads to exhaustion more quickly than in cold air. Such exhaustion probably increases the liability to disease or causes a diseased person to be more likely to die than is one who is not thus exhausted. When primitive tribes have migrated to tropical countries, as has frequently been the case, those who wanted to be always on the move, always doing something, may actually have killed themselves off because over-exertion has rendered them subject to disease. In this way tropical people may have become relatively indolent, not

merely because life is easy, but because the most energetic, strenuous types have been exterminated.

In the long run, the relatively low level of tropical civilization perhaps depends on people's *inclination* to work even more than on their *ability* to work. Ordinary experience, as well as careful scientific tests like those of the New York State Ventilation Commission, shows that in the steadily warm and often moist air of tropical countries people do not *feel* like working so hard as in the more bracing air of cooler climates. This applies to mental work quite as much as to physical. Many a man who works alertly all day at a temperature of 66° becomes sleepy after a few hours at 80° and simply cannot pursue a long hard line of reasoning. In this, perhaps, lies the most serious of all tropical handicaps.

Still other conditions also cause the human animal to be rarely at his best in tropical countries. His condition is like that of the horse; he is plagued by tropical insects, even if he is not in danger from tropical snakes and wild beasts. Anyone who has ever tried to make his way through tropical bush infested with ticks knows what misery may be entailed. The black flies of the pine woods of the north are worse for the moment, but they do not leave such long-continued festering sores. In the same way the mosquitoes of the northern woods bite as viciously as those of the tropical forests, but in the north the bitten person is all right in a day or two when the swelling disappears; in the tropical regions he is soon groaning with malaria that will not leave him for years, even if it does not kill him.

In certain places the mosquito exterminates man almost as effectively as the tsetse fly exterminates cattle. The way in which malaria decimated the workers in the early days in Panama is well known. During the building of the Indian railway from the Portuguese port of Goa to the main British sys-

tem, sixty-three thousand patients were treated for malaria. When the Tehuantepec railroad was being built in southern Mexico, work had to be suspended because of the loss of workers through disease.

Malaria is not the only disease which peculiarly handicaps the tropics. The hook worm disease, although not so fatal, perhaps does quite as much to reduce efficiency. In a great many tropical regions, half the population is infected with hook worm, and practically all have been infected at some time. How greatly this diminishes people's activity, even when it does not make them really sick, may be judged from the fact that in Costa Rica the amount of coffee land cultivated by sixty-six laborers increased from five hundred and sixty-three acres per month before they were treated for hook worm disease, to seven hundred and fifty afterward. In India, Java, British Guiana, and other places, a similar increase of from twenty-five to fifty per cent in the efficiency of laborers has been found after the hook worm was eradicated.

The efficiency of tropical people is also reduced by at least one other condition, namely, the variety and quality of the food. The many conditions already described, especially in the rain forest and the denser jungle, tend to cause tropical people to depend on a very small number of food products — the ones that can be most easily raised. That in itself has a bad effect upon health. In addition, the quality of the tropical foods is relatively poor. The banana, the melon-like papaya growing at the top of trees that suggest dark palms, the guava, bread fruit, cocoanut, mango, are excellent fruits, but for steady use it is very doubtful whether they equal the apple, or the orange which, unfortunately, is of poor quality in genuinely tropical regions.

The main trouble with the tropical fruits, however, is not their quality, but the excessive amounts in which they are

eaten in the regions where they grow luxuriantly. Many a child may eat little except bananas for several days in succession. The root crops and vegetables are likewise inferior. Manioc (or cassava), yams, pumpkins and sweet potatoes are scarcely so good a diet as onions, green corn, beans and white potatoes. The cereals, too, show the same contrast. Millet, maize and even rice are starchy foods, by no means so well balanced as rye, barley, wheat and oats. Then too, it is much more difficult to procure meat, milk and eggs in tropical countries. The animals best adapted to furnishing meat do not lay on flesh in warm moist countries; those adapted to supplying milk do not thrive at all well; the "tea-cup" cows of southern China illustrate how little milk they give. Even though the hen thrives, the other conditions which keep civilization low have prevented her egg-laying powers from being developed.

Here then is the sum and substance of the situation in by far the greatest tropical areas. Agriculture in one form or another is practically the only feasible occupation that has thus far been developed. The handicaps and difficulties of agriculture are decidedly greater than in cooler climates. At the same time, the warm climate, the constant growth of vegetation, and the absence of long seasons when no food can be gathered make the demands of life so few that it is easy to get a mere living without much effort. Hence the effect of natural selection in weeding out people who lack energy, thrift and foresight has presumably been much less than in temperate climates. This doubtless tends to reinforce the direct effect of the climate in producing a population among whom the average degree of energy is relatively low. The prevalent diseases have a similar effect, and so does the type of food.

The net result of all this is that while the difficulties are great, the stimulus to meet these difficulties and the energy wherewith to meet them are slight. Thus no matter what the



PLATE XI. GATHERING DYEWOOD IN BRAZIL.

A stage of development where the white man hires natives to search for a product in the forest.
(Keystone View Co., Inc. of N. Y.)



PLATE XII. OTTOMAN AND PIGMY ASSISTANTS, EXHIBITING A NATIVE VILLAGE IN THE
BAINING DISTRICT OF NEW GUINEA.

The denser and more humid tropical forests serve as places of refuge for many of the most primitive types of mankind
(Courtesy Allen Magazine)

degree of intelligence, or type of civilization, the tendency is for tropical people to accomplish less than those in lands that are cooler. It must constantly be remembered, however, that even in the tropics the differences from place to place are enormous. Where a great number of conditions are highly unfavorable, as in the dense rain forests, we have primitive savages like the pigmies. In other places, as in Ceylon, although many conditions are more unfavorable than in temperate regions, they do not prevent the growth of a much higher type of civilization, especially if rice culture prevails, as explained in the following chapter.

CHAPTER VIII

THE CIVILIZATION OF RICE LANDS

THE places where people live in great numbers, as we have already seen, fall into two distinct categories, rice regions and manufacturing regions, but the rice regions contain by far the greater number of people. If a shaded map showing the amount of rice per square mile is superposed upon a similar map showing the percentage of the population engaged in manufacturing, the result is a map much like that of density of population. If all the areas having over one hundred people per square mile are considered as densely populated, the rice type of dense population is represented in most of China; in much of India aside from the northwest and the north central part of the peninsula; in the central plains of Burma, Siam and Indo-China; in the islands of Java, the northern Philippines, Formosa and Japan; and in Egypt. Two main areas represent the manufacturing type. One in northwestern Europe includes most of the region from Great Britain and France through Germany to Italy, and eastward to Hungary, Poland, Lithuania, and even Ukraine; the other and smaller lies in the eastern United States from southern New England and New Jersey westward to Chicago and Milwaukee. Italy and Japan belong to a transition type combining the characteristics of the rice and manufacturing areas. All of the rice areas which are tropical have an unusually high civilization in proportion to their latitude, although those that are not tropical are less advanced than some of the other countries in corresponding latitudes. The rice type of civilization does not

differ from latitude to latitude so much as might be expected.

Does rice really have anything to do with the fact that the tropical or semi-tropical rice lands support approximately seven hundred million people, and have a relatively high and uniform civilization? That cereal certainly feeds more people than does any other single crop; its effect upon civilization has probably been greater than that of any other product except iron; and it seems to excel all other products in its effect upon the distribution of population. In order to understand all this, consider the yield of food per acre from rice compared with other crops. Few plants except potatoes exceed rice in their capacity to support a large population on a small area. In Java, for example, the average yield per acre is something like 2,000 pounds of rough rice. If we make allowance for two or three crops per year, as well as for the parts of each grain not generally eaten by man, and if we remember that rice can be grown every year without exhausting the soil, it appears that Javanese rice land supplies four to six times as much food per acre as does wheat land in the United States. Similar, although less extreme, conditions prevail in China, Japan, India and Egypt.

The most essential point about rice, however, is not the amount of food which it yields, but that its cultivation automatically solves many of the difficulties of tropical agriculture as described in the last chapter. The mere fact that rice requires constant irrigation is a great help in preserving the fertility of the soil, for new material is constantly brought from higher levels, while deep plowing is easily possible because the ground is soft. This obviates the necessity of clearing new fields every year or two, and enables a given tract of country to support a far greater population than is possible when large areas of unused land must constantly be left to grow up to

bushes. Moreover, the opportunity for concentrating effort on a single area year after year and of utilizing the streams for cultivation causes people to gather thickly wherever rice fields are cultivated. The mere fact that the population is dense and the land quite fully cleared diminishes the depredations of wild animals and helps to free the people from certain insect pests such as ticks. The insects and bacterial pests which attack the rice itself are relatively harmless compared with those which trouble such crops as corn and cotton. The fact that the rice fields are covered with water so much of the time helps greatly in keeping down the weeds. For storage purposes, likewise, rice far excels most of the other tropical foods. Because of its hardness it can be kept almost as well as wheat, for almost no other kind of tropical food is so resistant to the ravages of insects and fungi.

In addition to all this, the fact that rice is raised in water enables its cultivators to use domestic animals more freely than can those who employ other methods of tropical agriculture. This is partly because oriental cattle and especially water buffaloes are fond of wallowing in the mud, and work better in a wet rice field than almost anywhere else. Another reason is that rice fields, being soft and almost free from weeds, can easily be plowed with crude implements and weak work animals which would be completely balked by the stumpy, weedy, grassy fields of the people who practice hoe-culture. This last advantage is of extreme importance. The use of domestic animals, like that of machinery, vastly increases the work that each individual can perform and thus raises the scale of living. When all these conditions are combined it is evident that the rice raisers have an overwhelming advantage over the people who merely plant corn, yams and pumpkins in holes punched among half-burned stumps, and rely half the time upon the poor food furnished by bananas and coconuts.

Even yet we have not touched upon the main reason why the rice regions are so densely populated and are the most highly civilized places within the tropics. We have already seen some examples of the great geographic principle of natural selection. Let us see how it seems to work in the case of rice. We have, to be sure, no historic record of just what actually happened, but there can be little question as to the general accuracy of our inferences.

Wild rice is widely distributed, but its cultivation apparently began in India or possibly China. Thanks to some unknown genius, a group of Asiatics long ago attempted to cultivate this plant whose wild seeds they had presumably long been gathering. Among those who made the attempt some doubtless succeeded and others failed. Success then as now may have been partly a matter of accident, but in the main it must have come to those who were intelligent enough to profit by experience, and who were temperamentally stable enough to work in the hope of a deferred reward. At first the methods of cultivation were undoubtedly very crude. As time went on, the rice raisers learned to smooth off terraces and rim them round with little walls so that water might stand upon the growing rice for weeks. They built ditches whereby to bring the water from the streams. Each day they found it advisable to go around among their fields to make sure that the water was flooding all the terraces and to repair the breaks wherever they might be. This may not sound like a very arduous task, but such work is extremely irksome and confining for primitive people who have been in the habit of wandering freely here and there as fancy dictates in search of wild fruits, seeds and game. Only the intelligent, far-sighted and strong-willed, and only those who were physically and temperamentally fit for steady labor were likely to persist until the art of raising rice was mastered and a new and abundant source of food assured.

All this presumably required many generations. During that time, and for hundreds or even thousands of years thereafter, the art of raising rice spread gradually abroad. It expanded along the southeastern borders of Asia as far as Korea; it spread to some of the islands of the sea, especially Java, the Philippines, Formosa and Japan on the one side, and to Ceylon and Madagascar on the other. To other islands such as Sumatra, Borneo, Celebes and New Guinea, which at first sight would seem almost equally well fitted for rice, the art spread little or not at all. Whether this was due to difficulties arising from poor soil, droughts and the like, or to the backward character of the native inhabitants, or to the failure of these regions to receive sufficient immigration from rice-raising lands, has not yet been convincingly determined. Westward from India the spread of rice was checked by the dry climate. Rice did indeed reach Mesopotamia in the sixth century B.C. or thereabout, but neither there nor in Egypt did it become important until modern times.

Wherever rice culture took root two opposing groups must generally have arisen. One consisted of people who had enough intelligence, adaptability, patience and physical aptitude to carry out the rigorous and exacting routine of rice-raising; the other, of those who lacked these qualities. At first the two groups doubtless intermarried, but there was presumably a growing tendency for each to live by itself. Moreover, since social distinctions almost invariably follow the lines of occupation, they doubtless coöperated with geographical separation to check intermarriage, so that the groups must have become more and more differentiated. The wild, careless group presumably did not increase greatly in numbers because its resources did not expand. It still persists among the more primitive inhabitants of the remoter mountains and forests of Java, the Philippines, Formosa, and other rice-raising areas, and

among most of the population of the huge islands of Sumatra, Borneo, and New Guinea. In such places, even though hunting has ceased to be a main mode of life, the crude cultivation of coconuts, bananas, yams and such easily raised products provides a far less certain basis for progress than does the more arduous rice culture. Similar conditions are still dominant among the Indians who roam the vast tropical lands of South America. So long as these simpler modes of life persist, they seem to doom people to remain few in numbers and very low in civilization. They apparently persist not only because they are handed down by social inheritance and training, but because the inherited temperament of such people probably makes it difficult for most of them to settle down to steady work.

Wherever the cultivation of rice becomes well established, on the contrary, there is presumably a constant premium upon industry, forethought, and orderly government. The family that carefully looks after its terraces and dikes, pulls out the weeds, adds new fields, and saves good seed for the next year, is much more sure to have abundant food than is the careless family. The children are less likely to suffer from malnutrition and disease, and more likely to grow up and have children of their own. Moreover, the rich men of this type are the ones who can afford to purchase other wives and thereby increase the number of their children. Similar conditions are of course more or less true of every kind of agriculture, but rice culture exerts an especially strong selective effect because of the demands of constant irrigation.

For this same reason, as well as because the population becomes dense, the rice people must evolve an orderly form of government. People whose entire food supply for many months may be ruined by the lack of water for two or three days cannot afford to be squabbling and fighting all the time. They must agree upon methods of dividing the water fairly

and uniformly year after year. They must submit to regular officials to whom is entrusted the regulation of the water supply. Those whose fiery tempers or individualistic temperaments prevent them from submitting are likely to be ostracized or banished. Their case may be like that of an Afghan from near Kabul whom I once hired as a caravan man in Transcaspia. He and his brothers quarrelled with the neighbors over the division of water. First one party and then the other cut the ditches of their opponents. Finally, my man killed one of the neighbors and himself fled the country. In the course of many generations, such events weed out the kind of people who are not of an orderly disposition, willing to submit to authority.

We cannot trace the whole process step by step, but there appears to be abundant evidence that wherever rice is raised, not only do the standards of living rise and the qualities of thrift and industry increase, but a selection occurs which gradually weeds out those who will not work, and who will not submit to authority. All this produces a people who may be slow according to our standards, but who are comparatively steady, industrious, faithful, and law-abiding. The Javanese, Siamese, Hindus, Chinese and Japanese all exemplify these traits. In this respect they are a strong contrast to the non-rice-raising people of equatorial Africa, New Guinea, and the Amazon Basin, and likewise to the Mongols and Ainus north of China and Japan. So different are they from the others that Hindu coolies in South America and Africa are usually considered much better workers than are Africans or American Indians. Where they have been introduced, tropical agriculture improves decidedly. They cause British Guiana, for example, to stand much higher than its neighbors in the production of rice, sugar and other tropical products. In Natal, in spite of their good qualities as workers, their introduction has raised a serious race

problem. The Oriental exclusion laws of our Pacific coast are another place of the same problem.

Let us now inquire into the geographical conditions under which rice culture is most likely to take place. The Dutch possession of Java, lying a little south of the equator, serves as an admirable example. Java is smaller than Iowa. Nearly half of its surface is occupied by rugged volcanoes and other mountains. Yet it supports fifteen times as many people as Iowa. Moreover, its population has increased enormously — only five million a century ago, over thirty-five million today. Already Java has nearly as many people as France which is four times as large, and the end is not yet. Most marvelous of all, this equatorial island, with its teeming masses of human beings, is still practically self-supporting. Only a handful of people live in the cities, and only a few of the rest are engaged in trade or industry. The vast majority — nearly thirty million — live on tiny farms and raise food. They raise enough so that more than a thousand people are supported on an average square mile of cultivated land. Two acres of such land per family, and less in many cases, is all that the Javanese can claim as a source of livelihood. How is this possible? Of course the policy of the Dutch government enters into the matter, but we shall not discuss that, because similar conditions of land and people lead to extraordinarily dense populations in other places where the natives rule themselves, as in China and Japan. The presence of the Dutch in Java, like that of the British in India, and the French in Indo-China, intensifies conditions which already prevail.

The physical conditions which enable a country to support the maximum number of people without help from outside include level plains, deep rich soil, high mountains, abundant water throughout much of the year in the form of either rain or rivers, and high temperature and abundant sunshine

throughout a long growing season. Java has all of these, and so do China, Formosa, India, Egypt, Japan and Italy — every one of the regions where both rice and people are especially abundant. The mountains of Egypt, to be sure, are located far away in central Africa, but that is a minor detail. The outstanding fact is that aside from portions of the great manufacturing regions and very limited areas close to a few great cities elsewhere, practically every country which has over two hundred people per square mile possesses the physical qualities just described, and raises a relatively large amount of rice. The only important exceptions are the islands of Mauritius east of Africa, and Porto Rico in the West Indies. They possess the physical characteristics of rice lands, except that the mountains are low and do not produce long-continued floods. They also have a population of over two hundred per square mile, but sugar takes the place of rice as the main crop.

The necessity for level or only gently sloping land is so obvious that we need not discuss it. Nevertheless it is not so necessary as might be supposed. Even if there is not much level land, the rice-raising people's method of agriculture makes it natural for them to manufacture such land by terracing the mountain sides. That is one reason why such countries can support so many people. The terraces save the hillsides from being denuded of soil in the way that is so disastrous in our own South. In Java, however, although most of us picture the island as mountainous, one rides hour after hour over rolling plains, partly the old sea floor and partly the work of rivers. Of course, the mountains are never far away and that is one reason why Java can support so many people.

But level plains are of little use in themselves, no matter how deep their soil. The Amazon Basin has some of the most vast and level plains in the whole world, while New Guinea

likewise has extremely level plains along large parts of the coast. The trouble in those cases is that the plains are too flat, and too near the level of the ocean. Consequently they are practically always water-logged, the soil never has a chance to become aerated, or to be subjected to the useful bacteria which break it up in such a way as to prepare it for useful crops. The importance of the soil increases as one goes from colder to warmer climates. In Spitzbergen it makes little difference whether the soil is pure quartz sand containing practically no plant food, or the richest black volcanic ash. No crops will grow anyhow, by reason of the climate. In middle latitudes differences in the soil become important, for a state like Illinois shows a remarkable contrast between the rich-soiled central areas and the poor-soiled areas a few score miles farther south. In tropical regions, where the climate is especially favorable to vegetation, the quality of the soil becomes extremely important. To it is due no small share of the difference between densely populated Java and Jamaica on the one hand, and sparsely populated savage New Guinea and Amazonia, if we may so call it, on the other.

Even within Java itself and in regions where there is no question of water-logging, the mere difference in the quality of the soil produces an immense difference in population. In Java the *rural* population on the best soils of the lowlands, omitting the towns, reaches the extraordinary density of over one thousand persons per square mile in a volcanic strip extending across the center of the island from Tegal on the north to Djokjakarta on the south. In an area of about eight hundred square miles this rises to fifteen hundred, and in another area of three hundred square miles to nearly seventeen hundred. All of the people thus included are either farmers or tradesmen, artisans and so forth who serve the farmers and are in reality supported by the soil. Almost nowhere else in the whole

world do the soil, topography and climate combine to make it possible to support so many people on a given area.

Only two hundred miles to the west, on the north coast, the region of Krawang, some two thousand square miles in area, is quite as favorable as the most densely inhabited parts of Java so far as the relief of the land is concerned, and has almost as good a climate. Regions close by on either side have a rural population approaching a thousand per square mile. But Krawang is not enriched by fresh volcanic soil, and has a poor lateritic soil. Accordingly, the rural population falls to three hundred and eighty per square mile. That may be enormously dense according to the standards of most parts of the world, but it is sparse for Java. The difference between the laterite and the fresh volcanic material causes the population in Krawang to be only a quarter as great as in Klaten, two hundred miles farther east. Even if we make the fullest allowance for differences in the climate and relief of these two districts, the soil alone still appears to make it possible for three people to get a living in one area and only one in another. Let an equally poor soil be water-logged for thousands of years and we get a condition like that of the Amazon Basin where agriculture is practically impossible for primitive people. Thus the quality of the soil reaches its highest importance in warm wet regions where mankind has relatively little energy and is still in a low stage of culture so that he cannot adopt elaborate devices in order to improve it. That is where the volcanoes do the most good. Java and Japan without their volcanoes, old and new, would be quite different places.

It is easy to see how plains and good soil are necessary if the population is to be dense in rice-raising regions, but why are high mountains needed? The answer is two-fold; the mountains are needed partly to keep the soil from being exhausted, and still more to supply water. In Japan and Java

their importance in enriching the soil is especially great. Sometimes the volcanoes cover the fields with lava and ashes; they even destroy villages; but on the whole they are highly beneficent. Volcanic soil, especially of the dark types, is generally rich in the mineral constituents which are often called plant food. Java's active young volcanoes resemble those of Japan in containing large amounts of soft and friable material, easily eroded by rain, especially in the parts where the slopes are cultivated. If the underlying rock were solid, this would soon put a stop to further cultivation on the mountains. But as things are, erosion simply exposes fresh soil for the use of the mountain farmers, and carries other fresh soil down to the plains. Except among the upper parts of the virgin forests on the steep south side of Java, there is scarcely a clear stream in the whole island. That injures the scenery, but increases the fertility, for in every rice field a new layer of fresh soil is deposited each year. At the same time a great amount of organic fertilizer is deposited on the fields, for all over Java the universal custom is to use the running streams as privies. It matters not at all that the same stream is used lower down for the washing of people and clothes, for cooking food, and for drinking. Of course such a system tends greatly to spread typhoid, dysentery, and other diseases, but it certainly conserves the fertility of the soil. The results would be far worse, were not tea used very widely and most food eaten cooked.

The mountains do much more than this. Good soil alone will not lead to a dense population. Rain is likewise needed. Java would get a fair amount of rain even if it were level, for it is an island and lies near the equator. But the mountains there, as in every other rice region of dense population, greatly help the matter. They cause the inblowing air to rise and give up its moisture at seasons which otherwise would be dry. They also act as reservoirs so that springs keep the streams flowing

even in the dry season. In the same way India's dense population depends largely upon the tremendously heavy rains which fall not only upon the Himalayas but on the plains and on the border ranges of the peninsula. China receives very heavy rains both on its plains and on the high western mountains which feed its great rivers. Chosen and Japan are likewise remarkable for the torrential showers which water their mountains in summer, while the snows of winter in the highlands provide abundant water to irrigate the rice fields in the spring. Although Egypt itself gets no rain worth mentioning, the high, rainy equatorial regions which feed the Nile play the same part as do the mountains of Java. Even in Italy much of the density of the agricultural population is due to the Apennines and especially the Alps which condense the atmospheric vapor and send it earthward to form streams that can be used for irrigation. In all these regions the mountains and the rain join hands to water the lowlands, and incidentally to enrich them.

Still another condition is needed if a region is to support an extremely dense population. That condition is a growing season so long that more than one crop can be grown each year. Even in the more northerly rice-raising regions such as Korea, Japan and northern Italy, the summers are long enough and warm enough for two crops of some sort, although not of rice. In many areas of dense population and abundant rice, a steadily high temperature, averaging not far from 80° all the year in Ceylon and Java, often makes it possible to cultivate three crops per year, two of rice and one of some other quick-growing sort.

Before we can fully understand the density of population and the stage of civilization in the rice lands, the people must likewise be considered. One fact worth noting is that as a rule they need less food than do Americans or Europeans. This is

partly because most of them are small, as is especially well known among the Japanese but as is also true in southern China, much of India, Java and elsewhere. It is also in part because the percentage of young children is high. In the United States in 1920 less than twenty-eight out of every hundred persons were under fifteen years of age, whereas in Java the number was forty-one. The warmth of the climate still further reduces the food requirements. Not only are tropical people less active than those of cold countries, but they do not need so much fat and carbo-hydrates in order to keep warm. Where all these conditions combine, as among the Javanese, it is probable that the consumption of food by the average person is not much more than half so much as among Americans. In addition to all this, meat is not much used, and is not greatly needed. This also helps to increase the density of population, for at least two or three times as much land is needed to produce a given food value in meat as in vegetable products. In view of all this it appears that a given area of cultivated land produces food for twelve or fifteen times as many people in Java as in the United States. And what is true of Java is true to a less degree of each of the other rice areas where the population is extremely dense.

Even yet we have not gotten at the full reason why the rice lands are so thickly populated. The rural population of Java is approximately thirty times as dense as that of Iowa in proportion to the cultivated land, but purely physical and physiological conditions seem to explain only how it can be twelve or fifteen times as dense. The remainder of the difference must be due mainly to the standards of living. The people of the thickly crowded rice-raising regions do not require so much as do the people of Europe or the United States in the way of clothing and shelter because most of them live where it is relatively warm even in winter. Woolen clothing, furnaces, coal,

and cellars are only a few of the things that are needed for personal comfort in cold regions, but not in warm. Even in Japan this is largely true. It is not true in Chosen and northern China, where the winters are severe, but those countries only half belong to the rice type, for other grains such as wheat, barley, and millet assume high importance.

Not only the needs but the desires of the rice raisers are generally small. They are content with a scale of living which would seem impossible to the vast majority of Europeans and Americans. The immediate cause of this difference is doubtless found in social customs and long established habits, but why have such customs and habits arisen? Would they have been the same if the geographical background had been different? In all the main rice-raising countries the climate is so warm, damp and monotonous for a considerable part of the year that people do not have much energy. Even in Japan people rarely display the restless energy which often makes a Minnesota farmer almost resent every interruption. A series of hot days often gives us an inclination to work slowly. In countries like Java, Siam, India and southern China, a similar inclination lasts for generations. One of the things that most impresses the traveler is the leisurely way in which almost everyone does his work there; the people either sit around laughing and talking to a degree that seems to us inordinate, or else move listlessly. They do indeed go to their work early and keep at it late day after day, but the vigor with which they work is low compared with that of the people in western Europe and the northern United States.

All over the world, as we shall see in a later chapter, the standard of living has a close relation to health and physical vigor. The man whose temperament is inert, either by nature or by reason of an enervating climate, may be stirred by new desires, but after the imperative needs for food and shelter and



PLATE XIII. JAIN TEMPLE AT CALCUTTA, INDIA.

This illustrates the way in which the people of rice lands have shown a relatively high stage of civilization.
(Courtesy American Museum of Natural History.)



PLATE XIV. RICE FIELDS IN CEYLON.

The amount of perfect labor required in preparing and maintaining such fields as these is enormous.

the like have been satisfied, he is likely to feel that the satisfaction of most of those desires does not justify the extra work which they demand. When such a spirit becomes common, as happens almost universally in regions that are hot and damp, the march of progress is bound to be slow. There arises, as it were, a social inheritance of inertia in addition to the personal inertia of the individual. The old ways are good enough, not merely because they do not demand much exertion, but just because they are old. Thus the climate creates a tendency toward a small amount of work, and low economic standards, which become petrified in a conservative social system. Then climatic inertia and the social system work together to resist further changes.

Where the standards of living thus become petrified at a low level, the density of population is bound to be great if a large supply of food is easily obtainable. It is simply a case of mathematics. So much land is available, so much food can be raised per acre, and so much is needed per person. The population is bound to increase until these three conditions balance each other. In a rice region, each family, let us say, needs only half as much food as in a certain more active region; each acre supplies six times as much food as in the active region; and each family is content with no more goods than can be bought if it raises one-fifth more food than it consumes. The man in the active region can raise only one-sixth as much per acre, the average member of his family consumes twice as much food, and the other needs which he considers imperative demand that he raise surplus crops amounting to twice as much as he and his family eat. In the one case the land will support thirty times as many people as in the other, and the contrast will be like that between Java and Iowa.

Such then are the physical and sociologic features most favorable to an extremely dense population. As a rule, the

more nearly they are approached, the denser becomes the population and the higher the civilization compared with others in similar latitudes. New Guinea, as we have already implied, probably has failed to become a rice-raising region partly because of the water-logged condition of the soil along its coast and the lateritic character in many other regions. The same is true of the great Amazon Plain and of parts of Africa. Nevertheless, the highly important factors of distance and migrations must not be overlooked. The people who practice rice culture have never shown such energy in spreading their civilization over the world as have the Europeans. Even the Chinese never established genuine colonies at any great distance until European modes of transportation made it easy for them to do so. Thus in the future it is not improbable that rice culture will spread far more widely than at present.

Suppose the course of human progress should make it possible for the islands of Sumatra, Borneo, Celebes and New Guinea to be inhabited by rice-raising people. The conditions of soil, relief and rainfall would doubtless make it impossible to support a population as dense as that of Java. But almost certainly the population might be as dense as in the most sparsely populated sub-district of Java. There, in the western province of Bantam, the administration district of Lebak, nearly thirteen hundred square miles in extent, is extraordinarily rugged and has soil of only ordinary quality. It is part of the only region in Java where the people are so wild and independent that Europeans are not allowed to travel without special permits which are hard to get. Nevertheless, the density of the population is approximately one hundred and sixty per square mile. If New Guinea, Celebes, Borneo and Sumatra were populated with rice raisers even as densely as that, they would support more than one hundred and thirty million people instead of only twelve million as is now the case.

So great is the power of rice culture not only to supply food but to stimulate industry and select hard-working types for preservation, that the chances are that the introduction of a rice-raising population would in due time raise the density to a still higher figure.

The corresponding parts of Africa and South America could probably each support a far greater number. If rice culture should spread as widely as possible, the world's population might perhaps be increased by fifty per cent. Such an increase would scarcely be more phenomenal than the increase of the population of Java seven-fold in a century. It might take place with little or no disturbance to the rest of the world. But whether it would help the rest of mankind in its food problems, and otherwise, is quite a different question which we shall consider later. Our purpose here is merely to point out that in the past, and perhaps in the future, the conditions that favor the greatest density of population and the greatest aggregations of human beings are those which make rice cultivation feasible for people with tropical appetites, desires and modes of living, and yet with a high degree of culture according to tropical standards.

CHAPTER IX

TROPICAL PLANTATIONS AND FUTURE FOOD SUPPLIES

DURING the last century or two a new type of agriculture, the tropical plantation, has arisen within the tropics. A tropical plantation is usually most interesting and attractive to the northerner. Perhaps it is a sugar plantation in Brazil. In some convenient site, in the midst of a gently rolling topography, a tall, smoking chimney marks the location of the "central" or mill, surrounded by many smaller buildings, sheds and the like. Off to one side stands a group of pleasant houses, the larger and more pretentious of which are surrounded by pretty gardens set with trees enough to provide shade but not enough to shelter damp spots fit for mosquitoes. They are the homes of the white manager, chemists, engineers and others who form the brains of the organization. Farther away, perhaps out of sight of the mill, the brawn of the organization dwells in the thatched huts of a native village.

Outside the mill little tram cars on rails scarcely two feet apart are being pushed up one by one to the unloading platform. There colored men with more or less shouting and singing throw the canes out of the cars. Others cast them onto a moving platform which feeds them to large rollers that press out an astonishing amount of sweet, watery juice. Inside the mill the atmosphere is steamy and enervating; stickiness is the pervading characteristic; the sap as it flows into the containers is sticky; the steaming kettles are sticky; and stickiest of all are the slow streams of brown molasses that are gathered into hogsheads, and the great bins where yellowish sugar, not yet

refined, is being shovelled about like coal. Over everything there hangs a curious heavy smell compounded of the pleasant scent of fresh cane, the smell of molasses and sugar, and the odors of machine oil, steam and burning bagass, as the Spaniards call the squeezed cane fiber which is used for fuel.

Out along the many little tramways which radiate in all directions, one perhaps passes first a field of cane stubble, green to be sure, but looking like a weedy, poorly cut mowing field combined with a corn field where the stalks have been cut but only half carried away. Next comes a field where a new crop of canes has sprouted to a height of two feet, very rank and flourishing. The grass and weeds have likewise grown so well that a small army of brown-skinned men must be put to work cutting them down. Elsewhere another group is plowing the earth and burying bits of cane to start another crop. The next field is full of splendid great canes like corn stalks twice as high as a man. On one side its beauty is being spoiled, for a gang of cutters armed with big sharp machetes, as the heavy knives are called, is hacking away, felling a cane at each stroke. Where labor is cheap the leaves are stripped from the canes by hand, the useless tops are cut off, and only the neat green or reddish stalks are piled on the little tram cars. Where labor is expensive, as on the Australian plantations where white men do the work, the ripe fields are set on fire to burn off the leaves and tops. That saves work, but the blackened canes discolor the sugar so that more work is needed to refine it. But the work of refining is done by machines and is cheap.

On another plantation, far away in Ceylon, the lovely tints of row after row of pale green tea bushes, almost as high as a man, cover slope and hollow for miles near the crests of the mountains. The highest plantations, four or five thousand feet above the sea, become so cool during the nights of the dry season that sometimes a few acres of blackened bushes in some

hollow tell the tale of cool descending air that has brought a frost. In the unfrosted fields, an army of women with scanty clothing gracefully draped around them are plucking the tenderest leaves, while men bare to the waist pick up great baskets on their shoulders and carry them to the drying sheds. There the baskets are weighed, the tea is dried by artificial heat, and another group of women and girls sort it ready for market. A pleasant smell of green leaves and tea fills the air, and the women laugh and chat as they work.

A little removed from the factory and its many outbuildings, perhaps on the open top of some slightly knoll with a glorious view over miles of tea fields and dark green tropical forests, one finds the home of the owner or manager. Not far away, half hidden, but not too closely surrounded by trees, a few other houses of the white staff may be clustered. There you will find Englishmen of intelligence, sometimes with their wives and families, but often alone. Many of them, like some of the Americans at the sugar plantation, have traveled widely, know more about world affairs than do we who stay at home, and can talk most interestingly. But all too often, even men of this type are so bored and tired that they join their less intelligent countrymen in spending much of their spare time in the lightest kind of reading, in gambling, drinking, and otherwise trying to forget that they are exiles, as they feel themselves to be. They are in the tropics to make money, but not to make homes; their great desire usually is to succeed well enough to retire and go home.

Fly now to Venezuela, and visit a banana plantation, in a rolling, heavily forested region a few miles inland from the coast. It is something like a sugar plantation when looked at from above, for its characteristic feature is great areas of big-leaved green canes interspersed by the tiny threads of narrow-gauge tram lines. But here the canes are nearly twenty feet

high and six inches in diameter at the butt. The heart of the whole plantation is the big, cool-looking, heavily-screened house of the manager, a house with wide pleasant porches, standing on a grassy knoll where all the trees have been removed in order to invite the breezes and avoid the insects. Around it are other houses of the same sort, not quite so good, but fit for American families. On another knoll the hospital, mainly used by colored people, but with a section for the white Americans, forms a second center. Some distance away are the native quarters. Generally they do not stand on such high land as those of the foreigners, nor so far from trees and standing water, and they are by no means so carefully screened. Yet even there, much pains has been taken to insure proper drainage and sanitation, so that the conditions of health are far superior to those in an ordinary native village.

Each morning a troop of dark-skinned men leaves the village and goes out on the tram lines. They are drawn by a tiny engine operated perhaps by a white man who lost his job elsewhere through too much drink, or by an eager youth who longs for novelty, travel, and adventures. Arrived at a place where the weeds and bushes between the rows of banana canes are two or three feet high, part of the gang jump off to hack down the surplus vegetation and give the bananas the full right of way. Part go on to a section where many of the huge canes are bent downward under the weight of fat green bunches containing perhaps a hundred and fifty fruits. Two or three men take each row. If a bunch looks ready for market, the "cutter" lifts his long knife tied to a pole and slashes the trunk a few feet below it. As the bunch topples over, he eases it down with his pole onto the shoulders of the "backer." Other quick strokes of the machete sever the stem and lop off the long flower bud. Then the backer hands the bunch to the "mule man," or himself lays it down beside the tramway.

We might visit a coffee plantation in Brazil, a cocoa plantation in the Portuguese island of San Thomé off the coast of Africa, a rubber plantation in the Malay Peninsula, a model quinine plantation in Java, a coconut plantation in the Philippines, or a clove plantation in Zanzibar. In all cases the essential features are the same; namely, a product which is desired by the white man; relatively inefficient tropical labor; and white overseers, superintendents and skilled technicians.

The primary reason for tropical plantations is that the white man desires certain products which grow in warm countries and nowhere else. The people of the tropics, however, have so little initiative and are so content with life as it is, that they do not raise these products in sufficient quantities, no matter what price the white man offers. Accordingly, the white man goes to the tropics and tries to stimulate production. His first method was merely to establish a trading center here and there, and try to persuade the native people to bring what he wanted by offering them cloth, beads, knives and the like. Calcutta, Singapore, Batavia and Hongkong at one time were little more than centers of this sort. This kind of trading did not long prove successful because the tropical people were not tempted sufficiently.

The white man's next step was to employ his own agents, who traveled about picking up small quantities of tea, coffee, bananas or other products from the natives. He likewise began employing natives to gather wild products such as rubber, quinine and mahogany in the jungle. This likewise proved unsatisfactory. The quality of both the cultivated and the wild products varied enormously, and was often highly inferior. Moreover, the supply was hopelessly irregular.

The only remaining alternatives were for the white man to give up or else acquire land and begin to raise the things that he wanted. During the last few generations the plantations thus

established not only have increased enormously in number and size, but new products have constantly been added. Only a generation or two ago wild rubber was an important article of commerce; but none whatever was cultivated. Today rubber is one of the chief plantation products, and the wild article has almost disappeared from commerce. In the same way, no longer ago than the World War most of the palm trees whose coconuts furnish copra and palm oil either grew wild or were the property of natives, each of whom owned only a few. Today plantations of coconut palms are fast assuming great importance.

We hear so much about tropical products and tropical trade that we often greatly exaggerate their importance. How many truly tropical products are really important and how great is our trade in them? To begin with the genuine food products, sugar is far and away the leader — the most important of all tropical products whether foods or raw materials. The United States imports close to four hundred million dollars' worth of it, — the largest of all our imports. Coconuts in various forms, including copra, palm oil, and the shredded meat, come next among tropical foods, but are worth only forty or fifty million; then come bananas, worth scarcely half as much. All the other tropical foods such as pineapples, Brazil nuts, tapioca, rice, and chicle for chewing gum are only worth about half as much as the bananas. Moreover, although coconuts and their oil are employed for confectionery, salad oils and butter substitutes, most of the oil is not used for food, but goes into such commodities as soap and candles. Other fruits, aside from the banana, count for practically nothing as supplies of food, although long lists of them can be made. People often think that tropical fruits are more important than they are because the orange, lemon and grapefruit are mistakenly included. As a matter of fact, these are primarily semi-tropical and

rarely are found in good quality within the tropics. Aside from sugar, all the genuine food products imported into the United States from tropical countries are worth about as much as the peanuts raised in the country. In fact so far as food value is concerned, the peanuts rank far ahead. Obviously then, the tropical countries thus far do very little in the way of feeding us.

But even if the tropics do not feed us, they at least make us enjoy our meals. That is why we spend a quarter of a billion dollars each year for coffee, and something over one-tenth as much for cacao and likewise tea. Spices were the first of such stimulants or appetizers to be sought, but today, in spite of their large number, all of them together are worth scarcely half as much as the tea. Even if we add what little tropical tobacco we get, all the quinine, the coca from which drug-store drinks are made, and every other tropical stimulant or drug that we can think of, or that the Department of Commerce can haul into its statistics, all the rest of them, including the tea, and cacao, and even adding the palm products, are not valued at a third as much as the coffee alone.

But surely sugar and coffee are not the only highly important products which we get from the tropics. How about all the raw materials? Well, what are the raw materials? Which of them, for example, fall among the thirty most important products imported into the United States? Only rubber, worth two hundred million or so, and jute worth sixty million. With the jute, which comes mainly from the province of Bengal in India, should be put perhaps fifteen million dollars worth of Manilla hemp from the Philippines and nearly as great a value of sisal from Yucatan. Each of these fibers is peculiarly adapted to a special climate, and can be raised easily almost nowhere else. Aside from this, we do indeed import a few million dollars worth of cotton from India, Mexico, and other tropical coun-

tries, and some dye wood and mahogany from South America, but the wood is not a plantation product. .

The whole matter sifts itself down to this; we obtain from tropical regions three really important articles, sugar, coffee and rubber. Raw silk is the only other import that vies with them in value, but that comes from farther north in China and especially Japan. We also import two other stimulants — tea and cacao which are moderately important; three fibers — jute, Manilla hemp and sisal; one fruit — the banana; one nut — the coconut; and a group of spices. That completes the list of important tropical products which come to the United States or any other country. All together they comprise about one-fourth of our imports. The importation of any or all of them save sugar and rubber could come to an end without doing us any serious harm. To put it in another way, we could annihilate our trade with all tropical countries except Cuba, whence comes most of our sugar, and the Dutch and British East Indian region, whence comes our rubber, without seriously incommoding ourselves, and without cutting off our foreign trade by more than about twelve per cent. All our tropical trade together amounts to no more than our trade with China and Japan, and to less than that with Great Britain, or Canada alone. Why then do we make such a fuss about it? Why do we hear far more about increasing our tropical trade than about increasing any other kind?

The answer seems to be partly that the plantation products which give rise to almost the whole of the trade between tropical lands and others are mainly luxuries, and almost everybody spends far more time and energy in deciding about luxuries than about necessities. Another reason is that while trade with other regions increases of its own accord with the growth of population, tropical trade increases only when the white man acts as the motive force at both ends of the line. Almost no de-

gree of demand for rubber, for example, would cause large additional supplies to be available unless the white man himself starts plantations. In the third place, all the agitation about tropical trade is perhaps justified by the fact that nowhere else in all probability are the ultimate possibilities so great.

To turn back now to plantation agriculture, one curious fact about it is that practically all of the plantation products are perennials and the majority grow on trees or bushes. Jute, to be sure, is an annual, but it is not a plantation product to any appreciable extent, being raised in little plots by the Hindu farmers of Bengal. It is mentioned here merely because it is one of the chief articles exported from the tropics. Thus in his first attempt at cultivation within the tropics, the white man practically limits himself to trees, bushes and large succulent perennials. He is following in the footsteps of his tropical predecessors. Like the primitive savage, he began his exploitation of the tropics as a collector, who wandered around here and there picking up what he could of the products prepared by nature. Then he undertook to cultivate the trees and bushes, just as the primitive tropical people first began cultivating the trees that supply coconuts, bananas, bread fruit, and the like. As yet he has not reached a stage corresponding to that of the hoe culture of the tropical people who raise cassava, yams, sweet potatoes and pumpkins. Whether he will take that next step, and then go on to raise annual crops of cereals such as corn, millet, and especially rice, no one can yet tell. The chances are that he will do so. If these new steps mark as great a degree of progress for the white man within the tropics as they have marked for other races, one wonders what will be the final outcome. Will there arise a new and highly advanced type of civilization which stands as high above the white man's present tropical level as the rice-raising type of culture stands above all other types of culture that have thus far prevailed within the tropics?

Leaving these speculations, let us inquire as to how widely plantations are distributed within the tropics. The answer is that they are highly restricted. Only a few plantations are located as much as a hundred miles from the ocean, and the great majority are almost within sight of the coast. But all coasts by no means fare alike. Islands are the seat of tropical plantations far more than is the mainland. Cuba, Jamaica, Porto Rico, Mauritius, Ceylon, Sumatra, Java, the Philippines, Formosa and the Hawaiian Islands, together with the island-like Malay Peninsula furnish by far the major part of all plantation products. To these we may add a few coastal areas such as those around the Caribbean Sea, the palm-raising coasts of central Africa, and some parts of the coasts of India and Indo-China. Even the coffee region of Brazil is not far inland. The white man's penetration of tropical lands with his plantation agriculture is scarcely farther along than was his occupation of the New World and Australia when practically no settlements had been made as far inland as the Appalachian Mountains, even in North America. Is this in any respect an augury of the future?

We shall not attempt to answer this question, but there are several factors which greatly delay the white man in penetrating far inland. One of these is the climate. The health of the white man is one of the greatest difficulties in establishing plantations. In general, the seacoasts are more healthful than the inland regions, for the ocean winds, especially the trades, blow far more steadily than the land winds, thus tempering the heat and driving away the insects. Where a small island lies in the Trade Wind belt, on the borders of the tropical zone, as do the Hawaiian Islands, Porto Rico, and Luzon, the conditions of health are far superior to those in the interior of a great tropical land mass like Africa or South America.

Although the relatively healthful quality of the tropical coasts is highly important, it has not necessarily been the main

factor in determining the location of the plantations. The original reason for their location on islands and near the coast, and one of the main reasons even now, is accessibility. The people of European races went to tropical countries in ships, and ships are the only means of carrying away the products. It is vastly easier to go from one plantation to another by water than by land, for the difficulties of tropical transportation are very great in the regions where the rainfall favors plantations. With this may be put the fact that level land of the kind needed for sugar is more abundant near the coast than farther inland, while the coconut palm, like the human being, seems to thrive best where there is a touch of sea salt in the air.

Another interesting feature of tropical plantations is the large percentage that are located upon hilly or even mountainous land. In the Philippines, Java, Sumatra, the Malay Peninsula and Ceylon, as well as in Jamaica and on the mainland of the Caribbean countries and Brazil, many of the best plantations are on fairly hilly land at altitudes of several thousand feet. Practically all coffee and tea are raised in such regions, and so is a good share of cacao, spice and rubber. It is chiefly the sugar plantations which are located on the lowlands, although banana and coconut plantations show a similar tendency. The reasons why sugar needs level lands are obvious. The extreme weight and bulk of the sugar cane and the necessity of transporting it to the mills make the use of rough land almost impossible. This is likewise true to a less degree of bananas, but their perishable quality also makes it advisable to raise them near the sea coast so that no time shall be wasted in getting them to market. Palm trees grow as well and can be harvested almost as easily on slopes as on level land, but the direct effect of sea salt seems to be important in making them thrive near the ocean.

If a plantation product weighs little in comparison with its value, as is true of tea, coffee, cacao, spices, and even rubber, a fair degree of hilliness is no great disadvantage. In fact, it is often an advantage, for it insures good drainage during the heavy tropical rains, thereby helping both the plants and the people who work among them. But hilly and mountainous regions have another advantage. The white man who establishes a plantation at a moderately high altitude among the hills finds himself in a relatively healthful location. Not only is the temperature lower than at sea level, but there are more apt to be breezes on the hilltops than in valleys or where the land is level. For this reason, the man whose plantation is high up and whose house is on an open location at the top of the hill is decidedly more likely to succeed than is his neighbor in a lower and more malarial location. The less level lands have another advantage, especially where rice culture prevails, for they are relatively cheap. Good rice land is always expensive, even where everything else is cheap. Values as high as five or six hundred dollars per acre are not uncommon in almost all the main rice-raising lands. So the white man, in order to save expense, as well as to preserve his health, finds it advisable to take himself and his plantations to the hills.

Still another condition, the quality of native labor, imposes a serious limitation upon the location of tropical plantations. Since the white man cannot or will not work with his hands within the tropics, he must employ native labor, or else import people like the Chinese. The efficiency of tropical labor, as we have already seen, varies enormously. Hunting tribes like the Amazon Indians, Pigmies and Negritos, are almost useless as laborers; they are here today, gone tomorrow. People who practice hoe culture in its simplest forms, like some of the people of Africa, are a trifle better, but very unreliable. Those who raise millet and corn, as do the Negroes near the Niger, and

the Indians of the highlands of Central America, are more reliable. Yet even they may behave like the Maya Indian in Yucatan who failed to do the last day's work on a two weeks' job. "Why didn't you come to finish your work and get your money?" asked the white employer when the man at last turned up. "Oh, we had nothing to eat, so I spent the day fishing." He chose the chance of getting a few fish by nightfall in place of the certainty of two weeks' wages. The best of all tropical workers are the rice raisers. That is probably the main reason why the great majority of tropical plantations are found in the East Indies and the neighboring coast of southeastern Asia. There the white man takes the best available lands near the rice fields and hires the rice raisers to work for him. Sometimes to be sure, when he raises sugar, he actually cultivates the rice lands. He would do so much more frequently were it not for governmental regulations. In Java, for example, the government does not allow the rice land to be used for sugar more than one year out of three, nor can the white man purchase it.

In the New World, most of the labor on tropical plantations is performed by Negroes imported from Africa, or by a mixed race in which the blood of the people of Spain adds an element of enterprise and industry rarely found in either the Negroes or the Indians. On the whole, however, the tropical labor of America, aside from the West Indies and southern Brazil where the percentage of white blood is high, is by no means so satisfactory as that of southeastern Asia and the more advanced East Indies. Its unsatisfactory character is one reason why Great Britain and Holland, with their rice-raising dependencies, have had a practical monopoly of rubber, while Java raises nearly ninety per cent of the world's quinine. Most of the world's tea, as well as hemp and jute, come from that same general region.



PLATE XV RUINS OF QUIRIGUA IN A FOREST CLOSE TO A GELAT BANANA PLANTATION.
The ancient Mayas of Guatemala developed a high civilization in a region of dense tropical forest where today the heavy rains almost prohibit the raising of ordinary food crops like corn.

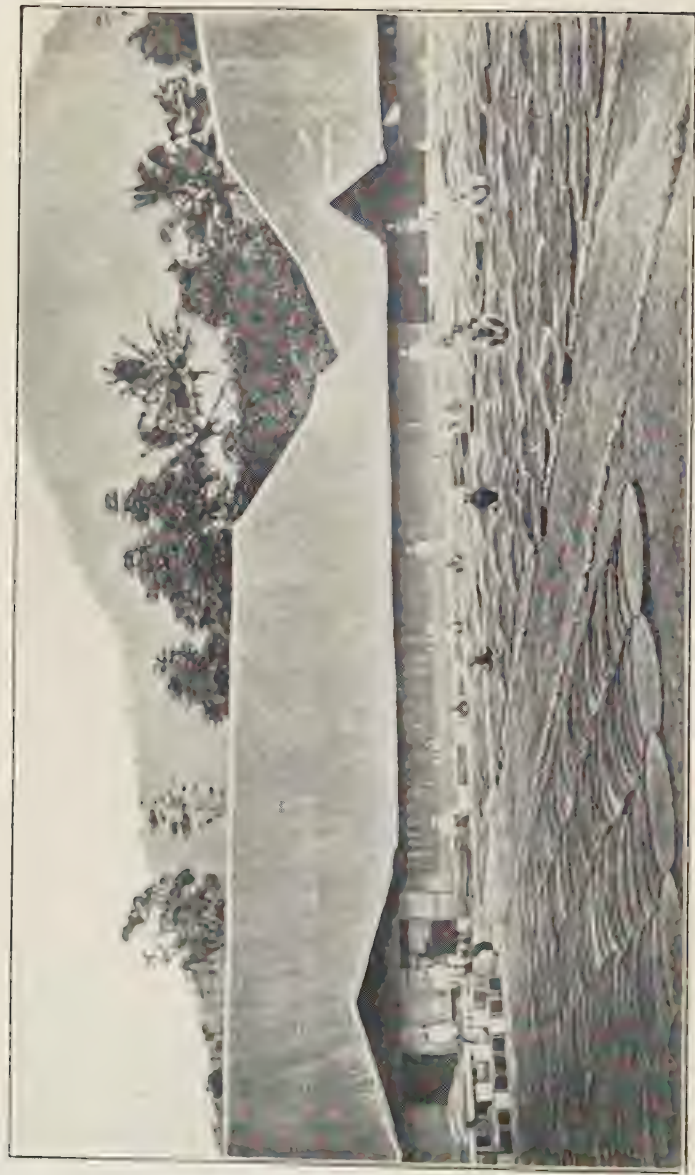


PLATE XVI. DRYING COFFEE ON A PLANTATION IN JAVA.

Although Java entire is famous, the cultivation of coffee has mostly declined in Java, while it has increased enormously in Brazil.

One of the most interesting questions connected with tropical plantations and with the tropics as a whole is whether they will some day furnish other parts of the world with large supplies of food. Many people believe that the vast unused tropical lands of South America and Africa, not to mention those of the great islands of Borneo and New Guinea, are capable of producing enormous quantities of food as well as raw materials, and thereby supporting the rapidly growing population of the manufacturing countries of Europe and North America. Perhaps something like this may happen in the future, but not unless a new mode of tropical development appears. Thus far the tendency has been in exactly the opposite direction. A hundred years ago, when tropical plantations were in their infancy, the tropical people were self-supporting. Cuba, Jamaica, Porto Rico, and Java never thought of bringing food from abroad except in minute quantities for a few white people. Today quite a different situation prevails. The production of food has declined in comparison with the population. When a white man starts a plantation, he needs perhaps a hundred laborers. He pays them such good wages that not only they but their families cease cultivating their own land. Food must at once be brought from somewhere else. So the planter begins to import corn or wheat in the ships which carry away his sugar or tea. That is the easiest way to feed his workers, for he does not see how he can take time to improve the local methods of agriculture, or increase the industry of the tropical people around him.

Of course the matter is not quite so simple as all this, but that is the gist of it. Cuba today is scarcely more self-supporting than England; in proportion to the needs of the people, the importation of food in the two regions is approximately the same. Even though vast quantities of sugar are exported, together with some pineapples and other foods, Cuba today is much

more of a drain on the food-producing resources of the temperate countries than she ever was before, and her tendency to require flour, meat and fish from other countries is increasing.

The same is true of every other place where tropical plantations have been highly developed. Where rubber, tea, coffee, cacao, spices and ropemaking fibers are raised, the products have no real food value whatever, yet the people who raise them must be fed. The wheat farmer in the Dakotas, Argentina, Russia and Australia is more and more called upon to feed not only his own country and the manufacturing countries of Europe, but the brown-skinned tropical men who raise the coffee and sugar that he drinks for breakfast, the afternoon tea and cocoa used by his more prosperous neighbors in the city, the cloves that his wife sticks in the juicy roast ham, the jute bags and the sisal or Manilla twine that he uses to tie up his wheat, and the rubber on which he rides to town. This may be good or bad, but people surely ought to understand it and not think that by developing the tropics we are increasing the world's food supply. We are doing just the opposite — we cause the population of the tropical countries to increase enormously, seven-fold in a century in Java — while the food production increases only a little, if at all.

There is, of course, no certainty as to how long the present tendency will continue. Some day, as we have said, the white man may evolve a type of agriculture as superior to the present type of plantation methods as rice culture is to primitive hoe culture. In that case he may raise the staple kinds of food as well as luxuries, which provide little nutriment. Suppose, for example, that the vast plains of the Amazon could be drained and plowed so that the soil would be aerated. Suppose that they could be converted into rice fields where the machinery now used in Louisiana could be applied on a vastly larger scale. In that case, the work of one efficient man with a tractor might

easily produce as much food as is now produced by a hundred industrious rice raisers. If that should happen, the world's supply of food in proportion to the population would increase enormously. Whether that is possible no one can yet tell. It depends partly on the degree to which the white man can live permanently in the tropics, partly on the degree to which the energy of tropical people and their desire for higher standards of living can be increased, partly on the soil, especially its degree of weathering, and partly on the lines where man's inventive genius next exercises itself. For the present we can merely point out that plantation agriculture is a new thing in the world; it is thus far mainly limited to a few islands and sea coasts where the conditions of transportation, health, relief and labor are especially favorable. Will it spread, flourish and evolve as the civilization of Europe has spread, flourished and evolved in the New World discovered by Columbus, or as the oriental type of rice culture spread long ago in the mainland and islands of southeastern Asia?

CHAPTER X

HEALTH, ENERGY AND PROGRESS

THE greatest of all problems in human geography is concerned with the degree of progress in different parts of the world. How far does this depend upon geographic conditions? Before we answer, we must define progress; for to one man it may mean greater faith in God; to another, more trade; to a third, more money to spend on art or pleasures. *For our present purposes we may define progress as increasing ability to dominate the forces of nature.*

This may not be the highest type of progress, nor the one that is now taking place most actively. The Hindus, with their ideals of quiet, mystical contemplation, may perchance be groping their way toward a new sense — telepathy — and thus be far out-distancing the rest of us. That would be no more strange than the evolution of the sense of vision. Hundreds of millions of years ago, when sight did not yet exist, a mere sensitiveness to light presumably caused some lowly organism to move toward the sun and thereby gain food or energy. Later, when many small mutations, or a few large ones, at last gave birth to the sense of vision, the organism's whole mode of life must have changed. A creature with eyes, living in a world of light and among creatures which cannot see, possesses an almost incredible advantage.

It may be that minds like those of certain Orientals who appear to be in touch with distant or dying friends may behave like an ordinary radio set. Waves of energy set up in one mind may make an impress upon others. If this should develop into

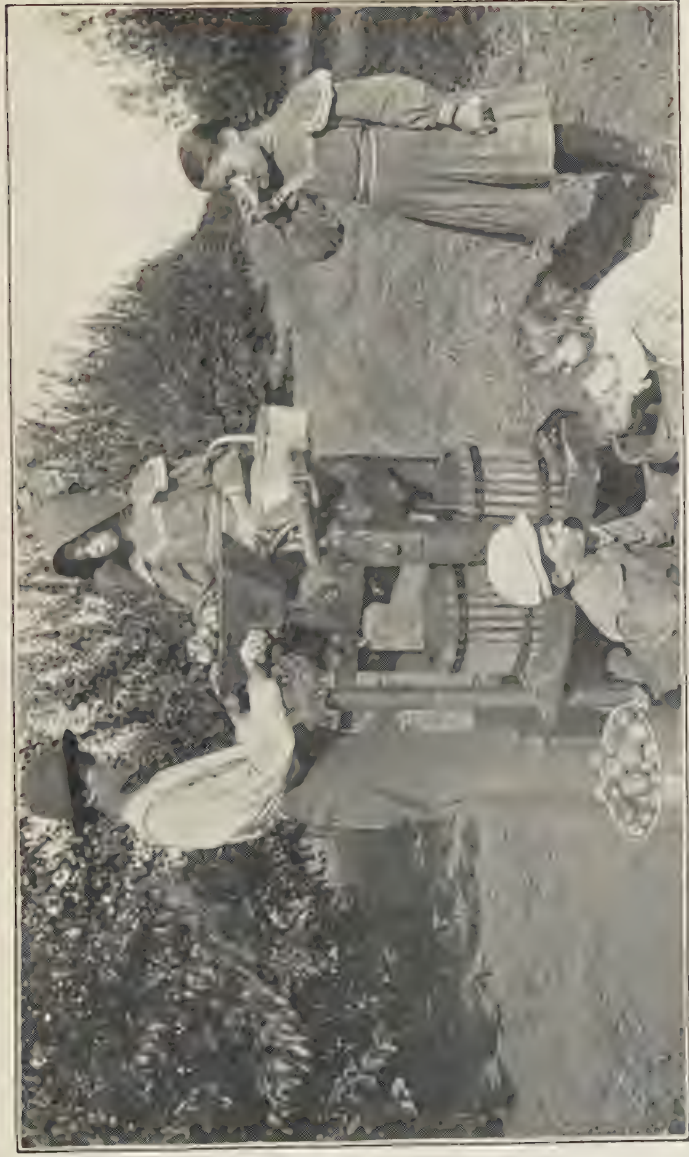


PLATE XVII. An Eucalyptic Party of Children on a Fruit Farm in the United States.
(Making Cider.)

Scenes of this kind are almost unknown except where the climate is healthful and stimulating.

a genuine sense of telepathy, it would revolutionize the world even more fully than sight has done. No one could harbor evil thoughts, for the moment he put them into words, even though unspoken, they might become known to others. People who were not pure and true and noble in thought as well as deed would be avoided as we now avoid those whom we know to be criminals. Little by little they would presumably die out. On the other hand, groups of people, even though physically far apart, could all tune in on the same wave-length and thus solve problems which now are utterly beyond the capacity of a single mind. All this, of course, is pure fancy, but it may bring home the fact that our particular line of progress is by no means the only or the greatest line. Nevertheless, since the control of nature is today the dominant aspect of human progress, we shall use it as our criterion.

Why, then, does man's power to control his physical surroundings differ so much from place to place? Is it mere coincidence that the English can fly in the air, sail beneath the ocean, manufacture machines by the million, and talk by radio, while not a man among the Kamchadales ever thinks of doing these things? Perhaps, but only in the same sense that the migration of sorely persecuted and highly skilled weavers from France and Belgium to eastern England rather than Kamchatka was an accident. Even if they had gone to Kamchatka, the cold winters, the chilly wet summers, the sparsity and barbarism of the population, the poor means of communication, and the difficulty of providing surplus food and raw materials, would scarcely have permitted them to stimulate that country's industrial life as they stimulated England's.

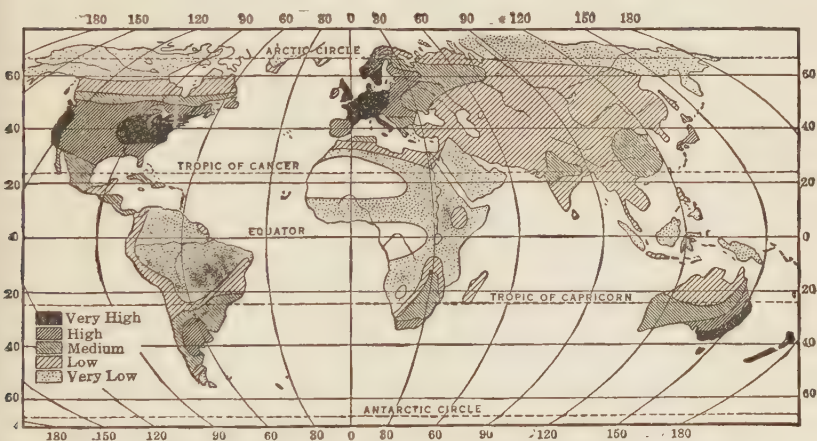
If accidents are not the main reasons for progress, are those reasons found in institutions like Christianity and democracy, in the special ability of certain races, and the development of certain fundamental institutions, or in the position of plains in

reference to oceans, rivers, land routes, iron, coal and climate? The truth seems to be that each and every one of these conditions plays its part. The task of the student is to determine where each stands in the chain of cause and effect.

This brings us back to the first chapter of this book. Climate paints the fundamental colors on the great human canvas, as we have seen again and again. The other geographic factors paint less widely distributed colors, which in certain places are so intense that the climatic pattern is obscured. But a new social institution and, still more, a new type of human culture may sweep over the whole canvas or some part of it, and alter the entire aspect of the picture. Yet however much this may obscure the old tints, it does not eliminate the geographic pattern. We have already seen examples of how occupations, diseases, food, clothing, transportation and the like conform to the main outlines set by climate and to the details set by other factors such as the soil. Such conditions represent man's *indirect* response to climate. They appear most clearly among people in the lower stages of development. The next step is to study man's *direct* response as shown by the effect of climate upon the human body and thus upon the way in which man's comfort, health, energy and initiative give him more or less assistance in the great task of making progress along the line of control over the forces of nature.

In order to see what the situation really is we need a map of human progress. Statistics and opinions are the only feasible means of making such a map. Both have been tried, and both are beset with difficulties. A reliable statistical map of progress in the world as a whole is as yet impossible because some countries have no statistics that are worth using; a great many have no statistics that throw much light on progress; and even where reliable statistics of the right kind are available, the methods of compiling them are often so varied that compari-

sons are almost impossible. Nevertheless, a fairly good statistical map of Europe can be prepared, and a much better one of the United States, as will appear in a later chapter. These maps are so much like the corresponding maps based on the opinions of well-informed men that we may safely infer that the same would be true if we had a statistical map of progress in the world as a whole. A map of progress based on the opinion



From "Business Geography." Courtesy of John Wiley and Sons.

FIG. 1. WORLDWIDE DISTRIBUTION OF CIVILIZATION.

of about fifty well-informed people in fifteen countries, including China, Japan, Canada, the United States, Australia and ten European countries, is shown in Figure 1. The general features are just as one would expect. The regions surrounding the North Sea in Europe and extending east into western Russia and south into Italy are heavily shaded, indicating a high degree of progress. The northern United States and southern Canada are also heavily shaded, as is the Pacific coast and part of Australia and New Zealand, together with Japan.

Geographers have again and again made maps of race, religion, government, and many other factors, and have com-

so good as if there is a change, especially a drop of temperature. The health of the community and the death rate vary in the same way, a drop of temperature being almost invariably beneficial, unless it be very extreme. This is true in winter as well as summer, and even if the actual temperature is so low as to be harmful if continued. The point of the matter is that the *change* is exhilarating. Like a cold bath it stimulates both body and mind, provided the cold conditions do not last long enough to induce a chill. Changes in sunshine and humidity as well as in temperature are probably a stimulant, although their effect has not been accurately measured. The wind likewise appears to have a stimulating effect, provided it is not too strong. The gustiness or irregularity which usually characterizes moving air acts like a constant series of little cool spells, each of which is refreshing — provided always that they do not become too severe and frequent. The failure to appreciate the great importance of variability in the weather is one of the main reasons why the pervading effect of climate and of changes of climate is even yet only dimly appreciated.

Variability of atmospheric conditions arises partly from the alternation of day and night, partly from the seasons, and partly from the passage of areas of high or low atmospheric pressure, especially the ordinary storms of the temperate zone. Other things being equal, people's health is apparently best where there is considerable variation between day and night. Such variability is especially valuable if the mean temperature and humidity are both high. It is at a minimum over the oceans in low latitudes; the maximum occurs in middle latitudes far from the sea where the air is dry and at seasons when day and night are nearly equal in length.

The variability due to the march of the seasons is probably much more important than that due to day and night. We have already spoken of its value in stimulating foresight and

thrift, but it appears to be highly valuable in its direct effect on health. Few conditions are more stimulating than the change which occurs when summer temperatures averaging 65° to 70° F. for day and night together are followed by weather when the thermometer begins to drop to 50° or 40° at night. The net effect of a change in the other direction in the spring, after cold weather, is also favorable, although a sudden warming up is debilitating and temporarily causes lassitude and a high death rate.

The storms which form the third great element in producing changes in the weather appear to be particularly valuable. Perhaps this is because they include variations not only in temperature, such as are the primary feature of day compared with night and even of season compared with season, but in sunshine, wind, humidity and cloudiness. A moderate storm such as may sweep across almost any part of the United States in the spring or fall, with a fairly warm day of rain followed by a cool, sparkling day of sunshine, is like a veritable tonic to both body and mind.

Such storms prevail abundantly in only a small part of the earth, a belt in each hemisphere. The main axis of the northern belt enters North America from the west a little north of the Canadian border, but the belt itself has a width of perhaps five hundred miles or more north of the axis and fifteen hundred south of it. As the belt crosses North America eastward it becomes more intense in longitudes where the axis lies in the great plains from Alberta to Manitoba, and still more so when the longitude of Ontario is reached just east of the Great Lakes. Then, with diminishing intensity, it proceeds eastward south of Newfoundland to Europe. There the North Sea countries receive the most storms, although their storminess is not so great as that of North America. Northern Italy has a storm area of its own a little separate from the main belt, and so does

Scandinavia. In Russia and the regions east of Italy the storminess greatly declines. Western Siberia is indeed traversed by a moderate number of storms, and it is there that wheat farming and railroads have become abundant, but practically all the rest of continental Asia is rarely traversed by ordinary storms. The continent is so big that it destroys most of the atmospheric whirls or traveling areas of low pressure which constitute genuine cyclonic storms. This is highly significant; it means that the inner regions of Asia where civilization is low are handicapped by lack of storms as well as by undue extremes of aridity and temperature. On the Pacific coast of Asia, storminess revives a little, while Japan is blessed with fairly abundant storms at all seasons.

In the southern hemisphere the storm belt is very strong and well-defined. Unfortunately it lies too far south to do much good to mankind, for most of the storms circle around the Antarctic continent, touching practically no land save the cold southern tip of South America.

In addition to the more frequent kind of cyclonic storm found in the two temperate belts of climate there is another, the tropical hurricane, or typhoon. This kind always originates in low latitudes, and moves westward instead of eastward at first. At this stage in their history, such storms often produce violent wind and rain. Nevertheless their stimulating power is weak because, while the wind and rain may be very harmful, the changes of temperature are too mild to make much difference. Moreover, such storms occupy smaller areas than those in higher latitudes which are often a thousand or fifteen hundred miles in breadth.

In addition to this, tropical hurricanes are so rare in any one place that between one visit and another a score or a hundred ordinary storms may visit a region in the storm belt



PLATE XVIII ANAMITE INDIAN COOLING HIMSELF BY FANNING WITH HIS
BRITISH RULERS BY WORKING A PUNKA OR FAN.

This man's feeling of lassitude, anæmia, and sleepiness is typical of steadily warm moist climates

farther north. It seems a curious irony of fate that the tropical hurricane which often does extreme damage in tropical countries should become an agent of good in higher latitudes, but such is the case. A great many hurricanes swing away from the equator as they approach the lands; then they re-curve more and more, spread out over a wider area, become less intense, and finally before reaching latitude 40° or so become well-behaved, stimulating eastward-moving storms which not only help to make the summers healthful, but provide rain for agriculture. The Atlantic coast of the United States receives many such storms, while a large share of the cyclonic storms which make Japan unique among Asiatic countries are of this type.

The combined effect of temperature, humidity, seasons, and storms upon health and energy is summed up in Figure 2. This



From "Business Geography." Courtesy of John Wiley and Sons.

FIG. 2. WORLDWIDE DISTRIBUTION OF CLIMATIC ENERGY.

shows how much climatic energy, as we may call it, the average person of European race would have if his energy and health depended on climate alone. The corresponding maps for other

racess have never been made. They may differ a little from the map before us, but apparently not much. In the United States, for instance, the Negro students at Hampton Institute in Virginia are at their best when the air is not more than four or five degrees warmer and a few per cent moister than the optimum for the white man. The difference between their optimum and that of the whites is nothing like so great as between the climates where the two races long dwelt before coming to America. For Cubans of mixed white and colored blood nearly the same is true, while the optimum for the Japanese seems to be almost the same as for the white race. Hence it appears that although racial differences doubtless exist, they are slight; the same general optimum applies to all — namely a climate with a decided seasonal swing but without great extremes of heat, cold, aridity or humidity, and with frequent moderate changes due to cyclonic storms.

A comparison between Figures 1 and 2 is highly significant. It shows that the areas of rapid progress and favorable climate are practically identical. The most prominent features are two great high centers in the northeastern United States and northwestern Europe. Away from these, in all directions, both climatic energy and civilization decline in essentially the same fashion in both maps. Even in the most favored latitudes between forty and fifty degrees from the equator there is a slight decline toward the dry interior of the United States and a great decline toward the far drier and vaster interior of Asia. On the Pacific Coast in both cases, there is a revival of health and progress, for the region from Los Angeles to Vancouver in America and the Japanese fringe of islands off the coast of Asia are peculiarly favored in both respects.

North and south of the main areas of good climate and great progress, both maps show a rapid falling off until the lowest conditions are reached in the cold regions of high lati-

tude, in the centers of the great deserts, and in the regions occupied by the densest tropical forests. In other words, the least healthful and invigorating climates are found in the very regions where dwell the people whom we have described as lowest in the scale of civilization.

CHAPTER XI

THE INTERPLAY OF CLIMATIC AND HUMAN CHANGES

IF only our two maps of progress and climatic energy were before us, we should have little hesitation in concluding that, barring the effect of recent migrations, the general distribution of human progress agrees with that of climatic energy. But the past, as well as the present, must be considered. If the climate of today is the main determinant of the areas of most rapid progress, as we believe to be the case, why was the distribution of progress so different in the past? Surely no one would claim that the map of civilization as it was two thousand years ago looks like the present map of either civilization or climatic energy.

The difficulty which thus arises had been met and largely settled before the close relation between civilization and climate had been thoroughly worked out. The climate of the past does not appear to have been quite the same as that of the present. Even in our own time, there are marked fluctuations from year to year. Thus the year 1925 will long be remembered for its sudden hot spell all over the United States in early June. The next year will be remembered especially for a hurricane which wrecked Miami in Florida, and for a combination of weather conditions which nearly ruined the South by producing a bumper cotton crop; but it was equally notable for its mild winter up to about the middle of February and then for a cold, raw period of two months which sent the death rate thirty or forty per cent above the normal. The year 1927 will be remembered not only for its Mississippi floods, but for its



PLATE XIX. THE CEDARS OF LEBANON.

These large trees like their relatives the sequoias of California, live to an age of 2500 years or more. Except in a few especially favored spots they are not now replacing themselves in Syria.

relatively warm winter, followed by a cool spring and early summer, a condition which produced the lowest death rate on record.

Thus far we have spoken only of minor climatic pulsations. There are longer ones of almost every degree of intensity. The so-called Brückner cycle, highly irregular in length but averaging thirty-three to thirty-five years, may cause periods of as much as ten years to average distinctly rainier or cooler than normal, while similar periods average warm or dry. Thus in England the years 1885 to 1892 were unusually cool, especially in winter. During those eight years the months from December to April fell below the average temperature in thirty-five cases out of forty. During the next eight years, on the contrary, no less than sixty-three of the ninety-six individual months were warmer than the average. In the United States abundant rains occurred almost everywhere for several years in the early eighties, while droughts were equally widespread from about 1891 to 1895.

Above the Brückner cycles in the scale of length and intensity come irregular periods lasting hundreds of years. A period of this kind in the fourteenth century was marked by a series of cool moist summers which produced one crop failure after another in England, and finally resulted in dire famine. The same thing happened in Norway and Iceland. Agriculture received a blow from which it did not recover for generations.

On the other hand, the seventh century after Christ was phenomenally dry, so that many formerly habitable regions on the borders of the desert were finally abandoned after struggling for centuries against the irregular progress of aridity. Evidence of an earlier moist period is found in ruined cities, aqueducts, gardens, public baths, canals, terraced fields, abandoned roads, hostelries and bridges in places where at present there is no appreciable water supply, or at least so little that the popu-

lation cannot be a tenth as great as formerly. Similar, but less convincing and accurate evidence is found in historic records of famines, crops, the dates of harvest, and the like. More reliable, but less easily dated evidence appears in old strands of salt lakes which for decades or centuries received enough water so that they rose many feet above their present level, compelling roads to make long detours to circumvent their deep bays, or dashing their waves against submerged ruins where the marks can still be seen. Some of these lakes disclose ruins that are even now buried beneath the water, so that we know that sometimes their level must have been lower than now as well as higher. Evidently, in the course of centuries the climate has suffered pulsations from wet to dry and back again.

The general opinion seems to be that the most reliable record of the climate of the historic past is found in the rate of growth of the great Sequoia trees of California. The growth of the woody layers of trees varies from year to year in response to the climate; that is why the annual rings differ so greatly in thickness and also in quality. In the high Sierras of California, where grow the Sequoias, the chief, although not the only, factor in determining the rate of growth is the amount and season of rainfall. By measuring the rings in the stumps of four or five hundred trees whose date of cutting is known, it has been possible to construct a climatic curve for California. Some of the trees were only a few hundred years old when cut, but three had lived more than three thousand. Nearly a hundred were close to two thousand years of age so that a fairly reliable record is available back to a date before the beginning of the Christian era, and a moderately reliable record for several hundred years earlier.

This record applies primarily to California, but is a help in determining the climate in other parts of the world. When it was constructed, a surprising thing became evident in the fact

that its main fluctuations closely resemble those of a curve of climatic changes in western Asia prepared on the basis of ruins, lakes, and the other lines of evidence described above. Then the growth of the trees was compared year by year with modern records of rainfall at Jerusalem. The two agree quite closely, especially when minor fluctuations are disregarded and the main trend for several years is considered.

Such an agreement is consistent with a great body of facts as to the relation of the climate in different regions. The earth's surface is spotted with what may be called climatic centers, that is, areas of more or less permanent high or low pressure. In all the high-pressure areas of a certain type, the fluctuations from year to year in pressure, temperature, and even rainfall are practically identical. In an opposite type of low-pressure areas the same is true, but the fluctuations are the reverse of those in the high-pressure regions. Intervening areas naturally display irregular fluctuations.

All this agrees with independent conclusions based on a study of the climate of the past. In Guatemala, for example, the final abandonment of the ancient Maya ruins and the northward migration of the center of Maya culture into the drier region of Yucatan appears to have been hastened and perhaps rendered inevitable by increasing rainfall. This presumably accentuated the difficulties of agriculture and transportation, and rendered the tropical diseases more virulent. The Mayas, it will be remembered, were the only people in the western hemisphere to invent the art of writing; they may well be called the Greeks of the New World. It may be highly significant that their northward migration finally culminated about the middle of the seventh century at the time when the Arabs burst forth from Arabia under the impetus of Mohammedanism. In both cases some human factor, such as the rise of a great leader, strife with neighbors, or zeal for a new religion, may have been

the immediate cause of a great historic movement. Nevertheless, in Arabia we have abundant evidence that prolonged and terrible drought had made the Arabs restless. They were not only willing but eager for a leader and a cause which would aid them in leaving their desert homes and ravaging the more fertile lands round about. Whether a similar social condition, due to excessive rainfall, prevailed among the Mayas on the tropical borders of the New World we cannot yet say, but the idea can by no means be lightly dismissed.

To go back to the Big Trees, they furnish interesting suggestions concerning events at many other times and in many other lands. For example, the oldest tree of all appears to have endured an extraordinarily dry time in its early youth. Of course the evidence of a single tree does not amount to much. Nevertheless, it is interesting to find that this tree appears to have been almost killed by prolonged drought at the very time when various lines of evidence indicate a dry period in the lands around the eastern Mediterranean. In the Bible this dry period seems to be recorded in the so-called plagues which Moses is reported to have brought upon Egypt. If the miraculous element is eliminated, the rest of the biblical record appears to be a straight-forward and convincing narrative of exactly what would happen if the Nile fell to an extraordinarily low stage. In addition to the migration of the Israelites who invaded Palestine, many other migrations are recorded at this same time, twelve or thirteen hundred years before Christ. They are just the sort of thing that normally occurs during great periods of drought.

At a later time, the trees record a period of heavy rain during which Babylonia, Assyria, Syria, Palestine, Egypt and finally Greece all rose to a high level of progress. Ultimately, however, a new period of drought, migration, war and misery set in after the days of Alexander the Great. Trouble seems to have

prevailed almost everywhere about two hundred years before Christ, as the very time when a period of rapid decline in growth is recorded in the Big Trees. At that time the Chinese were impelled to complete the Great Wall which they had been building piecemeal for two generations or more. Its purpose was to keep out the marauders who had continually invaded China from the deserts to the north. In the third century before Christ these marauders seem to have become far worse than formerly, while drought and famine apparently afflicted the Chinese to an unusual degree. The nomads of the desert presumably found themselves in such straits because of the dryness that they continually made raids upon their agricultural neighbors to the south. Even the marvelous Chinese wall did not suffice to keep them out, for the northern barbarians again and again overran China and imposed their rule upon it. In Greece and Rome at this same time depopulation and the degeneration of agriculture took place at an extraordinarily rapid rate. Palestine endured a period of great distress which probably had much to do with preparing the Jews to follow the lead of the Maccabbees in their desperate revolt against the Romans.

Some good authorities have supposed that the decline of agriculture in Italy at this time, about two centuries before Christ, was due to the exhaustion of the soil. This view is untenable; there is not the slightest reason to suppose that such deterioration would produce so sudden a change, or that it would occur simultaneously in Italy, Greece, Palestine and other places. Still less is it probable that a decline in the growth of cultivated plants in those regions would suddenly occur because of the depletion of the soil just when a similar decline in wild trees and grasses was occurring because of lack of rain in California, China and elsewhere. Moreover, the soil of China, Japan and India, although used for thousands

of years has not led to any such results by reason of exhaustion.

A century or two later, increased rainfall was coincident with one of the most peaceful periods that ever came to Rome — the reign of Augustus when the Temple of Janus was closed for the first time in two hundred years. Christ was born in Nazareth of Galilee at about that time, and Palestine was prosperous. All this suggests that if the Zionists would restore Palestine to its former glory, they must be careful not to choose a time like the dry epochs about thirteen hundred and two hundred years before Christ, or six and a half centuries after Christ. They must choose epochs of abundant rainfall and storminess such as apparently prevailed for centuries between 1100 and 300 B.C. and for decades in the Fourteenth Century of our own era.

Space forbids us to continue this record of climatic pulsations. For our present purpose the important point is that the climate of the earth is always fluctuating. There is almost no such thing as a normal climate, for the farther back we go the greater become the fluctuations. The extremes of the historic period were much greater than those observed since records have been kept, but were themselves exceeded by those which prevailed during the climatic stages that have marked the period since the culmination of the last ice age. Yet those in turn were mild compared with the huge pulsations belonging to the glacial period with its repeated recurrence of glacial and interglacial epochs.

Evidently then, a map of climatic energy in 400 B.C. when Greece was in its glory, would be different from a map of the same kind either today or thirty thousand years ago when the last glaciation was near its height. So far as we can judge, although opinions differ, the most important feature of climatic pulsations is changes in the location and intensity of the main areas of atmospheric pressure and of the storms which skirt the

edges of such areas. In our own day, such differences from year to year and decade to decade are of extraordinary importance. They bring events like the Mississippi flood of 1927, the bumper cotton crop of 1926, and the droughts that drove people out of Kansas in the early nineties. Even when the barometric pressure and storminess are notably different from normal, the mean temperature for the year as a whole may depart very little from the average. Yet the rainfall and still more the variability of the weather may vary to an extraordinary degree.

On the basis of reasoning like this, we conclude that when Greece was in its prime the belt of maximum climatic energy apparently lay nearer the equator than at present, perhaps not far from Greece and Rome. At any rate, the storminess of Greece and Rome seems to have been enough greater than now to cause an appreciable improvement in health and efficiency, not only there but in all the lands around the eastern end of the Mediterranean. At the same time excessive storminess apparently lessened the efficiency of Germany and England, for storms, like almost everything else, have their optimum, their level of most favorable frequency.

Pulsations of climate are not the only factor which has tended to change the location of the geographic areas whose climate is best for human progress. Another factor, the "cold-ward march of civilization," first adequately discussed by S. C. Gilfillan, must by no means be overlooked. Types of civilization, like types of humanity, have optima. These optima may depend mainly upon climate but they are also greatly influenced by soil, vegetation, fuel and the like. Somewhere, for example, perhaps in Java or perhaps farther north in Japan, a certain combination of conditions has the maximum tendency to promote progress among people whose culture is based upon the art of raising rice. Obviously, the optimum cannot occur

where frosts, droughts, or floods often ruin the rice crop. Nor can it occur where the people are continually weakened and discouraged by malaria. The optima for the crop and the people may perchance be located far apart. That is unfortunate, for then the optimum for that particular stage of human progress will have to be located between the two other optima, and neither the crop nor the people will be at its best.

Similar conditions are true for every other type of culture. Take the extreme case of people who have not yet learned to use fire, clothing or any shelter other than the trees. Such people might be greatly stimulated by a cold climate if only they could stand it. If set down in Greenland, however, they would probably all perish in a year; in New York they would barely survive; in Virginia they might do fairly well; but only as far south as Florida, perhaps, could they really be at their best. Their physiological reactions to climate might be exactly like ours; yet the highest development of their culture might occur in a climate much warmer than that which is best for us today. Remember that when we define a climate as healthful or the reverse, we are not thinking of naked savages, but of ourselves with our warm clothing, warm houses, easy transportation, and corner groceries supplied by well-filled cold storage warehouses and grain elevators.

As mankind rises in the scale of civilization, his power to cope with low temperature increases. The first man who threw the skin of a slain animal over his back to keep him warm made it possible for primitive man to endure considerably colder winters than before. The first who built a fire or a warm hut took another great step in the same direction. The fireplace, stove, hot-air furnace and steam heater represent still other steps. Glass was extremely important in this respect. It permitted people to have light enough for all sorts of delicate work, and at the same time keep their hands warm enough to do the

work even in the coldest weather. Winter days which had formerly been largely wasted could now be devoted to useful sedentary work like weaving, the making of tools, or the discovery of scientific truth. But the use of glass for the windows of houses and workshops did not become common until after 1600 A.D. In his book on *Glass in the Old World* Mr. Wallace-Dunlop states that a century before that time glass was so scarce that according to a law made in 1505, although the windows of a house belonged to the heir the glass was the property of the executors and might be removed by them, "for the house is perfect without the glass." In 1599, however, the law was changed to read that glass annexed to windows by nails or in any other manner could not be removed, "for without glass it is no perfect house." Yet as late as 1650 the use of window glass was still so uncommon in Scotland that only the upper rooms in the royal palaces were furnished with it, the lower part having wooden shutters which were opened or closed as might be necessary.

Now it so happens that some of the most valuable climatic conditions from the point of view of both health and mental stimulus occur mainly where the temperature during part of the year is low. This is true of storms with their high variability; it is also true of the seasons with their tremendous stimulus toward forethought and thrift.

If people can obtain the benefit of these climatic conditions without suffering from low temperature, they will evidently enjoy better health and achieve more than otherwise. That seems to be what has now happened. We have reached the point where our command over nature permits us to live almost anywhere. If we so desired, we might live on the ice in Greenland or Antarctica. Many occupations, to be sure, would be impossible there, but that need not prevent a dense population, provided some other factor makes it worth while to go to the

enormous labor of transporting everything over the snow and ice.

Agriculture is one of the occupations which cannot move to Greenland. It prospers only where both soil and climate are favorable. Rice raising, for instance, cannot spread into cool climates, and the rice raisers must permanently endure the handicap of unfavorably warm, damp and monotonous weather unless some marvelous new discoveries are made. The miner, too, must live where the ore is found. In fact, every primary producer is geographically tied to his product. Those who cater to the immediate wants of the primary producers are likewise tied down to definite geographical locations, no matter whether the climate is good or bad. What use is a grocer, policeman, barber, carpenter, doctor or minister unless he lives near enough so that you can find him when you want him?

Certain occupations, however, are almost independent of such geographic controls as the soil, the location of minerals, and relation of climate to agriculture. As time goes on, they are becoming still more free. One of these is manufacturing. Originally, to be sure, the manufacturer needed to be near his raw material, and likewise near the primary producers who provide his main market, as well as food for his workers. Later he felt the necessity of being as near as possible to supplies of coal. As the value of human labor increases in comparison with the value of mere materials, the necessity for being tied down to any special geographic environment diminishes. At Birmingham, Alabama, for example, the presence of coal, iron and limestone, seems to be a reason for the development of a great and varied group of iron industries. Yet only the coarser types of manufacturing are done there to any large degree. The finer types are found in the North where, on the whole, the labor is more efficient. The cotton industry furnishes another interesting example of a similar sort. During the present

century there has been a strong tendency for the cotton mills to move from New England to the South. They have gone there partly to be near the raw materials, partly to avoid restrictive legislation concerning child labor and other matters, partly to be near the southern portion of their market, and partly to draw on an untouched supply of white labor where wages are low.

All of these are sound geographic reasons for the location of the cotton industry in one place rather than another. Nevertheless, the finer types of cotton spinning and weaving maintain their hold in the North. Massachusetts still has more spindles than any other state. Just what the future will bring forth is not clear, but many observers prophesy that within a generation most of the cotton mills will move back to the North. If wages and laws should become the same in the two regions, and the intelligence of the laborers should be equal, the experience of other industries suggests that the more stimulating climate, and the better health and greater energy of the workers in the North might bring the industry back again. But the iron and cotton industries deal with bulky or heavy raw materials, and for that reason are still tied quite closely to geographic conditions other than climate.

Quite a different set of conditions prevails in certain other industries, for already they are almost foot-loose, so that they can be established anywhere. Silk weaving, watch-making, the making of high-grade chemicals, and the manufacture of jewelry are examples of industries where the cost of transportation is so small that the quality of the workers becomes the chief factor in determining whether a given location is good or bad. The higher types of mental activity are likewise becoming more and more free to locate themselves where they will. Institutions of research, banking houses, universities, stock exchanges and wholesale organizations are a few examples of the many

types of institutions which are almost free to choose their own location.

In the higher branches of university education, such as graduate schools, and most of all in pure research, the non-climatic factors of the geographical environment still further lose their importance, while the health, energy, initiative and physical buoyancy of the workers become of paramount importance. Almost anyone who has done much creative thinking or writing will tell you that in no other type of work does he find his powers so different from day to day, so dependent on his state of physical well-being. Today one writes slowly, wearily, grinding out a few poor pages that later are thrown away. Tomorrow one writes rapidly, easily, clearly, accurately, page after page, till a whole chapter is finished. Such a chapter often requires only a little revision, whereas the chapter written in ten times as many days must be worked over and over, and even then is not satisfactory. The days when the worst chapters are written are those when the air is close indoors, no matter what it may be outside, and when one feels dull, sleepy, and discouraged both physically and mentally. The days when the best chapters are written are usually cool and fresh, with a bit of sparkle and tang in the air, or perhaps gently and pleasantly rainy; the kind when it is joy to be alive.

Unconsciously but surely, people tend to go to the places where such conditions prevail most frequently, for that is where they can accomplish the most. The immediate spot where this can be done may be determined by the location of a harbor, river, or easy route to the interior. The general region is determined mainly by climate. That is why the world's scientific research and other intellectual activities, as well as its financial, commercial, industrial and political control are more and more becoming concentrated in the few limited regions where the climate is most healthful and stimulating.

Does all this mean that mankind is becoming free from geographical control? Not at all. It merely means a change in the geographic factors which exert that control. Here is the whole thing in a nutshell: The lower the stage of human culture, the more inevitably man is compelled to live near his food supply, and to follow only the occupations for which the local environment is favorable. As he advances in culture he becomes able to transport food and raw materials so that he begins to concentrate his industries in places which he finds especially advantageous. At the same time he finds himself more and more able to pursue sedentary industries in cool climates because he learns to utilize clothing, buildings, glass, and heating devices. In addition to this, he unconsciously finds that in fairly cool climates his innate ability increases because he must exercise judgment, economy, thrift and foresight in preparing for the winter. Those who fail in these respects are likely to be eliminated. Finally, although even yet he scarcely knows it, mankind discovers that in a certain type of cool, stormy climate with a strong but not overwhelming contrast of seasons, he has better health, greater energy, and more initiative than anywhere else.

As a result of all these tendencies, the centers of civilization keep moving into the regions where man's stage of progress makes him most efficient. In doing this the direct effect of the climate upon the well-being of the human body assumes greater and greater importance, because it is the condition of environment over which man's control is thus far least perfect. He can bring food and raw materials from the ends of the earth, and they are just as useful as if raised in his back yard, but manufactured climates are not yet satisfactory. We have a moderate sort in our houses in winter, but no one has manufactured a good climate for arctic regions or the tropics. Finally, in addition to all these reasons for changes in the centers of

civilization, the climate itself varies more or less from century to century and millenium to millenium. When storms are more abundant in lower latitudes than at present they are especially helpful in increasing the activity and progress of people whose control over nature is limited compared with ours. Thus the climatic conditions during the more stormy epochs before the days of Christ were highly advantageous to countries like Egypt, Assyria and Greece, because they provided the stimulus of greater variability and windiness to people who could not yet be at their best in the cooler climates where storminess now does the most good. Thus the final location of the centers of civilization and of the main regions of manufacturing and the like, is the result of man's changing control of nature, plus the changing aspects of nature itself.

In spite of this relationship between climate and progress, we should not expect a perfect agreement between the two at all times. Man is a migratory animal; he keeps moving from one environment to another; he carries his civilization with him. When Englishmen settle in Jamaica, or Germans in tropical Brazil, they form an island of high civilization in the midst of a lower civilization. Nevertheless, as time goes on, even the migrants tend to conform to the climate in which they live. This does not mean that the British settlers in Australia and South Africa will ever go back to the level of the natives near whom they dwell. It does mean, however, that in the future the people who settle in these unfavorable lands are not likely to go ahead as fast as those who remain where the climate is better. The people in the poorer climates are practically certain to have poorer health and less energy than the others. The population as a whole is likely to be less prosperous, so that education and contact with other people are less prevalent. Moreover, under such circumstances there is a strong tendency for the more able people to leave the poorer environment.

This last tendency is clearly evident in the Bahamas. Those islands are occupied by a combined population of British and Negroes. Many of the British are descendants of Loyalists who left the southern parts of the United States at the time of the Revolutionary War. The Loyalists as a whole were people of high character and ability. Their descendants still display those same qualities; many of them are as cultivated, high-minded and competent as any of their fellow Britons elsewhere. Yet in a certain sense they have degenerated. They themselves deplore the fact that their physical ability is not equal to that of the Loyalists who migrated from New England to Ontario. They deplore still more the fact that it seems wise for many of the more vigorous young people to go away from the islands, not only for education, but for their life work. They sympathize with the Bahaman girl who had studied nursing in New York: "Do you enjoy life more in the United States or in the Bahamas?" she was asked. Quick as a flash she answered: "How can one help enjoying it more there? There one *feels* like doing things; here one never feels like anything."

But there is more than this to the matter, for the abler boys and girls are attracted to the more stimulating climate not only because it makes them feel energetic, but because the opportunities are greater than elsewhere. Thus the higher the degree of civilization and the greater the freedom with which people can move themselves and their goods from place to place, the greater becomes the tendency toward the concentration of manufacturing, finance, government, education, science, art and every other kind of leadership in the regions which offer the optimum conditions of comfort, health and energy. As time goes on, this tendency becomes so strong that the centers of power actually begin to swing from place to place according to the seasons. The thirteen million people who are concentrated within a hundred miles of New York are one of the most

powerful groups in the whole world, unrivalled perhaps except by the thirteen million in an approximately similar area around London. But in February and especially in July the New York area loses a good deal of its power because so many of its leaders are in Florida, southern California and the Riviera, or at Newport, Bar Harbor and the Adirondacks.

The preceding discussion partially answers our question in a previous chapter as to whether the tropics will ever be reclaimed. Doubtless the white man will do much toward reclaiming vast areas in tropical America, Africa and elsewhere. He will introduce machinery, he will act as supervisor, he may even run the machinery himself, and he will teach the tropical people to work much more effectively than at present. The productivity of areas like the Amazon Basin and central Africa may rival that of any other part of the world. Nevertheless, it is practically certain that the center of power will never swing to tropical countries unless some wholly unsuspected discovery revolutionizes the tropical mode of life. The discovery would have to cause life in the tropics to become so attractive and so invigorating to both mind and body that the most able people would want to live there. That might happen if the people of the future should learn to protect themselves against heat as readily as we protect ourselves against cold. That will be very hard to do — because the inertia which is the keynote of comfort within the tropics is also one of the greatest enemies of human progress. Activity on the other hand, is highly valuable as a means not only of keeping warm, but of making progress. Of course it is possible that in some far future a new race may evolve whose optimum climate is warmer than that of the races of today, but that scarcely cuts much figure in the plans of the present generation.

Putting aside all speculation as to the far future, we can sum up the whole thing by saying first, that the *general* pattern



PLATE XX. TEMPLE OF ISIS AT PETRA.

These ruins in eastern Palestine appear to represent a high Nabatean civilization which developed under the influence of a more favorable climate not far from the time of Christ.

of the distribution of civilization throughout the world has always depended closely upon climate; second, that man's increasing control over nature keeps tending to change that pattern; third, that migrations likewise introduce continual changes in the pattern; and fourth, that as soon as a migration has occurred, the climatic conditions begin to mold and select the migrants to fit the new environment. The climate makes certain occupations profitable, and others unprofitable; it is enjoyed by people of some temperaments and not by those of other temperaments; it causes people with one type of physique to have better health and more children than those with other types of physique; it makes certain types of food, shelter and clothing advisable, and others unhealthful. In the long run, ill health, failure and gradual extinction are the lot of those who cannot or will not adapt themselves to the climate, but before that happens many migrate to other climates better adapted to their physiques, temperaments, occupations, habits, institutions and stage of development. This has happened repeatedly, though slowly, in the past; it is happening far more rapidly today, especially among the peoples who are most highly civilized and mobile.

CHAPTER XII

*THE CONTRAST BETWEEN JAPAN AND CHINA*¹

WHAT sort of picture do the words "Japan" and "China" bring to your mind? Do they suggest the same sort of people, the same sort of scenery, the same sort of civilization? Or do they suggest countries as different as England and Italy? To those who know them best, the differences are generally more noteworthy than the resemblances. To me the word "Japan" brings up a vision of the deck of a steamer, a soft warm rain falling straight down without wind, blue mountains dimly seen through banded streaks of pale clouds above a dull greenish sea dotted with white sails. Then mists roll in and we are solitary. When the mists rise once more the land is near at hand. No mountains now are visible; great inaccessible cliffs, slashed by steep-sided gorges, rise abruptly from the water. At the top of the cliffs a low plateau forms a maze of hills. Some are covered with trees, mostly pines, which break the sky-line with dark clumps; but the majority display the paler tint of dense thickets of tall reedy grasses, clumps of bamboo and other bushes, and groves of maples and other deciduous trees. Everything is green, as it is all over Japan, save on the rocky mountains, or during the winter at high levels and in the north. Few countries save Ireland are greener. Between us and the green hills lies the pearly, misty, moving water, and groups of fishing boats. Little wisps of cloud keep forming in the valleys and spreading out as bands along the hills, only to rise as

¹ Much of this chapter and the next is based on the author's two books entitled *West of the Pacific* and *The Character of Races*.

shreds and tatters, and disappear in the great cloudiness above. But the intense greenness, with its many shades, impresses us even more than the wetness and the pearly mistiness.

But where is man in all this scene? The boats indicate an abundant fishing-population. That great headland ends in the fine white column of a modern lighthouse, but where are the houses of the fishermen? See that dark-brown patch at the mouth of the valley, with a bit of bright green behind it? Look more closely, to right and left. There is another and another. They are the villages, and the pale-green patches are bits of rice land. See how that village stretches out, a thin brown line of houses at the base of the cliff. Will not the waves of the next typhoon eat it up? Every speck of level land seems to be covered with houses or rice fields. How can so many people live where there seems to be only room for a road?

Come closer to the shore and look at this lovely bit of Japanese scenery. Directly in front a dainty little gorge opens its green jaws, with a bit of yellow cliff on one side for variety. A laughing waterfall surely lies hidden among the trees. On either side the sea is faced by green bluffs, not precipitous like those we saw before, but far too steep, it would seem, for habitation. They are shrouded in bushes and trees, among which crooked pines bent by the wind are conspicuous. Already we are becoming familiar with a large part of the elements that make Japanese art so unique — mountains, cliffs, clouds, mist, bays, boats and pearly seas, and likewise brooks, waterfalls, dense vegetation, and picturesque crooked trees. We have seen these landscapes dimmed almost to black-and-white, as in the southern school of Japanese art, mere impressions that can be painted in a few strokes — and we have seen them bursting into masses of color, full of dainty detail, as in the northern school.

Now we see other scenes on which that same art is based.

A dozen small boats appear and a crowd of people flocks along the shores. In the boats the bare brown limbs of fishermen harmonize with their blue garments. Here is a man with tight white trousers and a blue smock bearing between the shoulders a big white circle enclosing white designs. His head is swathed in a black cloth, while a white cloth hangs under his chin like a beard. Others have tight brown or blue trousers, long blue robes, and dark-blue cloths around their heads. More picturesque are the mushroom hats, very convenient to shed the rain. Here come some more boats, better still. See the grass hats like little tents, the dripping grass cloaks like bigger tents, and the grass shelters like little cabins. On shore a rapidly gathering crowd displays the long Japanese kimonos of both men and women, the gay umbrellas of oiled paper, and the awkward shuffling gait due to wooden clogs. We are not on an uninhabited shore, as one might at first imagine. Even on these steep slopes scores of thickly thatched houses, yellowish or blackish in tint, peep out from among the trees. Japan is assuredly not only a moist land, a green land, and a land of mountains, mists and seas, but it is densely populated — so densely that one marvels again and again.

Sail up now into one of the scores of land-locked bays that help to make the Japanese one of the most maritime people in all the world. On our left, miles away but clear as crystal against the freshly washed blue sky, rises the lovely cone of shapely Fuji, white on top, shading off to blue lower down, and vanishing at the base in a faint dainty haze which seems almost to be some sort of ethereal soil from which the magic mountain grows like a fairy mushroom. Nearer at hand two business-like tugs send out columns of black smoke to trail far behind them and cast purple shadows on the water. But they cannot spoil the lovely sunset, for now the sky is partly cloudy, and the sun goes down in a brief blaze of crimson. Before it is gone

we have sailed up Yokohama Bay, past modern lighthouses, a modern breakwater, great dry-docks and shipyards, tugs, barges, huge ocean-steamers, and up-to-date wharfs—centuries distant from the grass-clad fishermen whom we saw a score of miles away.

Come ashore now, in the morning, and ride in a jinrikisha. What a disorderly jumble fills the rough, muddy streets—bicycles, man-carts, jinrikishas, horse-carts, ox-carts, a few automobiles, and hosts of people. Most of the people walk on wooden clogs to keep out of the wet. They are fairly agile in avoiding the mud splashed up by the running jinrikisha men, but pay little attention to automobiles, for in Japan the automobile is merely tolerated. The vehicles that really belong in the Japanese streets are man-drawn. According to the official figures of 1920 for every automobile in Japan there were at least a hundred bicycles, and twenty jinrikishas or man-drawn carts for merchandise, compared with fifty horse-drawn carts and seven or eight ox-carts. Even now the proportions are not much different, although automobiles are more common there as everywhere.

One of the most pleasant features of a ride in any Japanese city is the brightness and vivacity of the streets. I do not mean merely the multitude of gay banners above almost every business street, nor yet the colorful openness of the shops where one can see what is going on inside. I mean also the great variety in the style of dress. A man dressed in a grass hat and coat may be exchanging courteous bows with another dressed in ordinary European clothes and looking extremely well groomed. A much larger number, although dressed in European style, have extremely baggy trousers while their shoes are much turned up at the toes from sitting on their knees on the floor. A far more attractive type of dress is the long kimono, or gown, restrained brown tones for young students,

darker and more beautiful colors for the more conservative older men. Mingling freely among these more elegant types are the working people and coolies in tight trousers or bare-legged, and wearing short dark-blue smocks with large white designs implanted boldly between the shoulders. Some wear straw hats, of all descriptions, many are hatless, and some wear mushroom-like rain-shedders, like miniature umbrellas, sometimes of black paper, sometimes of straw. But why try to describe the indescribable? Japan is in transition, and the Japanese are extremely sensible in permitting people to wear the dress that best fits their work. The coolie's tight trousers, bare legs, and bare shoulders are admirably adapted to his work. European clothes are all right for people who sit on chairs. If those same people want to sit on the floor, those who can afford it substitute kimonos for trousers and coats. And delightfully comfortable those kimonos are for an evening at home.

Not all of Japan is changing. The women are almost uniformly dressed in the old style regardless of the impracticable character of their kimonos with pillows behind and long sashes. The kimonos are so tight around the knees that walking is difficult, the ten-foot sash wound around the waist is hot, and often has to be drawn much too tight in order to hold the full skirt out of the mud. But even if the women's dress is uniform in cut, it varies delightfully in color, and is wonderfully set off by the contrasts between the kimonos themselves and the pillows. Nevertheless, the dress of the Japanese is not what makes their streets so bright. The smiling faces of the men are what do it, the dainty charm of the women, and the delightful vivacity and merriment of the children. A race with such qualities has a tremendous asset.

But look closer into the life of the Japanese. One is continually puzzled to know just where to place these people. If

one comes to them directly from China, they seem quick, alert and prompt. If one comes to them from America one is impressed by the frequent delays, the apparent disregard for set hours. One sympathizes with the English clerk at Cook's office in Yokohama: "Where do you think you are? You are not in America. It takes two days to get a letter eighteen miles from Yokohama to Tokyo." Yet at that same Yokohama one boards a trolley car as freely as at home. We Americans think that our street-car system is the most highly developed in the world, but in many Japanese cities trams seem to be as numerous and as crowded as among us. Or one travels by train and quickly realizes that for so mountainous a country Japan has an extremely well developed and widely spread net of railways. A few things such as the disorderly way in which fruit skins, papers, and everything else are thrown on the floors, and a certain lack of precision in the cleaning of corners and the repair of things like door knobs, give the critically minded foreigner a chance to gibe. But the Japanese trains are practically always on time — much more so than ours, although they do not go so fast. All over Japan one has this same feeling of perfection in some respects, coupled with carelessness in others.

In spite of what has just been said about greenness, no one can deny that while Japan is green on top, it is bare underneath. What I mean is typified by a beautiful garden in Tokyo, lovely with azaleas and irises and shaded by pines and other trees. Stone paths wind among the trees and encircle a tiny hill and a miniature lake most delightfully. So much is crowded into half an acre that it might hold one's attention for hours. Nevertheless, the American or European misses our level turf with its cleancut edges. In place of turf he finds bits of bare ground, patches of moss and liverwort. The summers are good for the ranker kinds of vegetation, but much too constantly wet as well as warm to favor the growth of the finer types of

grasses. That is one of the great reasons why domestic animals of all kinds are relatively scarce in Japan, and why milk is such a luxury that it is sold in little bottles like ginger ale at the railway stations.

The Japanese streets as well as the gardens seem unfinished to a European; even in Tokyo there are only a few bits of sidewalk, miles and miles of city streets show little hint of any plan to separate pedestrians and vehicles. The streets are dug up on every side and the majority are rough and have a disorderly look. Curiously enough, few people take much responsibility for the streets outside their own grounds, no matter how fine the grounds may be. Although the Japanese are proverbially of a public-spirited and artistic temperament, this does not seem to apply to public streets, public conveyances, or anything public. Love of beauty is not love of order. Among the Japanese the love of beauty sticks out everywhere, but the love of order is far more highly developed in England and Holland.

In the Japanese factories the same characteristics stand out clearly. One is impressed by the extent to which the factory system has developed, at least so far as the cotton and silk industries are concerned. Yet one constantly feels that the exact mechanical side of manufacturing is not the point in which the Japanese excel. They can copy other people's machines to the letter, but they rarely invent anything themselves or even make changes to adapt other people's machinery more perfectly to their own uses.

On the other hand, when it comes to social agencies such as day nurseries for children, dormitories for working girls, public libraries, dispensaries and the like, one feels that the Japanese are in their element. Among them, as a sociologist would put it, the social instinct is very highly developed. Yet curiously enough, even in their most up-to-date bits of work, such as a well-equipped hospital connected with an industrial plant, the

sort of carelessness which goes with the artistic temperament is often apparent. The basins in the operating rooms are often broken and rusty where the enamel has chipped off; there is dirty water in some of them, and in general there is a certain lack of finish and precision.

Of course I recognize that similar deficiencies occur in every country. The point is that while in some countries they impress even the casual traveler, in others one does not think of them, although other deficiencies may be glaring. In Holland, England and Sweden one rarely thinks of this particular type of deficiency, whereas in India, Turkey and Mexico it is glaringly evident, while in southern Italy and the northern, tropical part of Australia it is evident to a milder degree, as in Japan. Perhaps the whole thing may be summed up by saying that the English, Dutch and Swedes possess in high degree, and the Japanese only in low degree, the quality which enabled the character in PINAFORE to sing:

“I polished up the handle so carefuller
That now I am the ruler of the Queen’s navee.”

The explanation of the Japanese deficiencies in orderliness and in the quality which keeps things in good repair is often said to lie in training. The Japanese, so the argument runs, have only recently learned to use machinery, modern sanitation, modern transportation, and the like. Therefore they have not yet learned to take care of their tools. This explanation does not seem satisfactory. When the English and Dutch had had only sixty or even twenty years of modern industrial development, the newness of the tools and methods certainly did not prevent them from being just as neat and tidy and orderly as they are now. It seems to me that the explanation lies mainly, and perhaps equally, in two things: first, the artistic and social temperament of the Japanese, the origin of which I

shall not attempt to explain; and, second, their comparative lack of physical vigor due to the wide prevalence of anaemia and other minor ailments.

Few people realize the extent to which the capacity of a nation is tied up with the number of illnesses and the death rate. Even in June an inordinate number of the Japanese, especially the children, suffer from colds and running noses. Among civilized nations few have so high a death rate as Japan. The average there, since 1900, has been above twenty per thousand practically all the time, and in many years has risen above twenty-one, especially from 1916 onward. It is often said that this is due to the increase of manufacturing and the movement of the population to the cities. That, however, can scarcely be the explanation, for in countries like Australia and the United States the relative growth of the cities has been greater than in Japan, but the death rate has fallen. Moreover, the manufacturing population is still relatively small in Japan. Even if the death rate among factory operatives has doubled or trebled since 1900, it would scarcely account for the apparent rise in the general death rate. The fact seems to be that aside from a few countries like Spain, Hungary and Chile, Japan has the worst health among the comparatively advanced nations, and it is almost unique in showing no apparent decline in the death rate.

Three of the main reasons for Japan's high death rate are: (1) the unbalanced diet; (2) the great density of population; and (3) the unfavorable summer climate. The great deficiency of the diet is the excess of rice, which must form eighty or ninety per cent of the food of millions of people. As to density of population, it is a well-established fact, that the death rates in cities and in dense populations are higher than in rural districts or sparsely populated regions. Japan has so many people that whenever a child is born, it is almost essential that

somebody die to make room. Such conditions mean that major diseases, and likewise minor ailments of all descriptions, are correspondingly common, and that people's energy is constantly sapped by disease.

The heat and humidity of the summer are probably as important as a poor diet and overpopulation in sapping the strength of the Japanese. Perhaps the strongest evidence of this is the relation between the birth rate and death rate at different seasons, as I have shown in *Civilization and Climate*. In order to understand the effect of the climate on the births, let us take the month of conception. In June, when the stimulating effect of the beautiful spring weather reaches its culmination, the average daily number of conceptions which gave rise to living children was 574 during the years from 1901 to 1910. The corresponding number of deaths was only 233. Three months later, in September, when the hot humid summer had produced its maximum effect, the conceptions that resulted in living children fell to an average of only 311, whereas the deaths rose to 317. In others words, the summers are so debilitating that the Japanese have not the strength to produce children. If they had to endure the summer climate all the year, their numbers would apparently diminish, instead of increasing at the rate of half a million a year, as is now the case.

Thanks to their diet and the summer climate, most of the Japanese feel more or less wilted from the end of June to the early part of September, nearly three months. When people feel physically inert, especially if they have the artistic temperament, it is extremely easy to leave things at loose ends and to be careless about all sorts of little details. When good weather returns in the fall, it takes months to get over the physical effects of the bad summer. It is doubtful whether these effects are ever completely neutralized. Moreover, if

physical inertia causes people to form the habit of being careless during part of the year, the habit is apt to persist indefinitely. Thus the climate and diet of Japan, when taken in conjunction with the artistic and social temperament, help greatly in explaining why the Japanese fail to rise to European standards in orderliness, precision and mechanical accuracy, although rising above the European standards in courtesy, love of beauty, and social responsiveness. Yet bear in mind that in orderliness and so forth as well as in energy the Japanese stand farther ahead of the Chinese than we stand ahead of them.

It is harder to draw a picture of China than of Japan. That huge country is so diverse that it has all sorts of climate and scenery. In the far west eternally snowclad mountains display peak after peak which far surpasses Fuji in height if not in symmetry. Massive plateaus, snowclad for more than half the year, present vast stretches of grassland in summer, or of gravel scantily clothed with a little vegetation. To the north of China, as well as to the west, lie vast deserts, among the largest and most intense that the world can boast. In some of them, as in Chinese Turkestan or Sinkiang, waves of pinkish sand — yellowish near the borders — extend for hundreds of miles, rising in line after line to heights of anywhere from five to five hundred feet. Such deserts are not the most common kind; still greater areas consist of scores or even hundreds of miles of gravel, silt and clay laid down one after the other as turbulent rushing rivers debouch from the mountains, spread widely in many finger-like branches, and are compelled to flow more and more slowly by reason of the gentler slopes of the lowlands. Sometimes the water of a single river spreads out over hundreds of square miles at the acme of the summer floods, provided the snow on the great mountains has been especially abundant. The clays, in turn may extend almost level

for hundreds of barren miles, or they may be eroded into fantastic tables separated by steep-sided troughs where the scouring winds have had free play for centuries. Sometimes the clays are interbedded with salt and gypsum, in which case we infer that they represent the deposits of lakes that have now disappeared because of increasing aridity. Sometimes the beds of the old lakes are visible in the form of great plains of white, gleaming salt broken into rough masses like the waves of a choppy sea, as at Lopnor.

The sand and the salt of the great deserts are almost uninhabited, but the gravel and clay, as well as the plateaus, are the home of nomads like the Mongols who dwell in round felt tents and wander in regular circuits with their camels, horses and sheep in the lower deserts, or like the Tibetans and Khirghiz in the high plateaus. But why do we describe the homes of such people? They are not Chinese. No, but they are an essential part of the cultural area which centers in the rich deltaic plains near the coast. All through the ages they have sent their overflow outward into China and thus have profoundly molded Chinese history and differentiated China from Japan.

Even if we confine ourselves to China Proper and southern Manchuria, which is as much Chinese as any other part, the contrasts are far more extreme than in Japan. In the north the traveler may bear away a strong impression of bitterly cold winters, and of a mantle of snow in which the cart-wheels creak complainingly while clouds of vapor rise from the tugging horses. Or perchance one thinks of a bitterly cold wind, well down toward zero, sweeping remorselessly across bare open plains and bearing a miserable, irritating load of dust from the desert. That is the kind of dust which in Shensi and Shansi has accumulated to a depth of scores of feet and forms the famous loess. Japan has cold weather in the far north

and on the high mountains, and its mountains have deep snows, but orange trees grow where most of the Japanese live, and there is nothing comparable to the dry, dusty, bitterly cold winds of North China. In summer, on the contrary, the air all over China is warm and moist, even warmer than in Japan, but not so persistently damp. Yet when rain does fall heavily, it is even more severe than in Japan. Think what it means when twenty inches fall in as many days. But in an ordinary summer the rain is merely heavy enough to cause everything to be delightfully green. Then China like Japan becomes a land of gardens and crops. Millions of people may be seen wading in water half way to the knees, bending at the waist, hour after hour, day after day, as they stick the pale green rice seedlings into the watery mud, or plowing with cattle in the north and with water buffaloes farther south where most of the rice is grown. As the Chinese work in the fields they give the same general impression as the Japanese — indomitable patience, eternal industry, and unvarying economy in utilizing every scrap of ground, every scrap of fertilizer, every hour of the day.

The Chinese, even more than the Japanese, may move slowly compared with Europeans and Americans, they may leave things in disorder to an extent that tries our nerves, or at least our esthetic sensibilities, but both races certainly do work and save. In that respect they display the most highly developed qualities of the rice-raising type of culture, carrying them to a higher pitch than anyone else. Watch that plot of ground in Chekiang province south of the Yangtse with its spring crop of wheat, barley or beans, its summer crop of rice, and its winter crop of rape to be eaten as greens when young and tender. See how the living encroach upon the plots allotted to the dead leaving first a space three feet by seven feet in the midst of a cultivated field, then whittling it down with each plowing until

it becomes two by five, and one by three. Finally, in some districts, the grave is represented by a little pottery cylinder six inches in diameter and so small that it merely occupies the space that must anyhow be left between most kinds of plants in order that they may get light and air. By and by the cylinder will be shattered by the plow and not replaced. That is how ancestor-worshipping China manages to find space for the living instead of the dead. If all the graves were allowed to remain full size, most of China would now be a graveyard.

In spite of many resemblances North China makes a very different impression from Japan. In Japan, on a clear day, the mountains are always in sight — so near that they can scarcely be forgotten; the rivers are merely small streams which usually cut little figure in the life of the inhabitants; in China the plains seem boundless, and the swells and hollows are so slight that one can scarcely detect them. But what is that line of hills off there in the distance? Hills? Oh, no, that is the river, in a mile or two we will climb up to it. Here we are on top of the embankment; behind us a slope leads down to the plain where the people dwell; in front, almost at our very feet, a boiling, swirling, yellow river gurgles past; if the rains keep on it may soon overtop the bank whereon we stand.

In the Yangtse region the plain is more frequently broken by hills and the rivers do not flow at such high levels as in the Huang region and that of its southern neighbor, the Hwai. Yet all through the lowland coastal sections of China one is oppressed by the flatness of the plains, their nearness to the water, and the degree to which they are everywhere intersected by waterways. One sees it at Nanking on the Yangtse, at Shanghai and the neighboring cities, at Fuchow, even though mountains rise close to the lowland, at Amoy, Canton and a hundred other places. Because the Chinese plains are so flat and so interlaced with sluggish water-courses navigation by means of

small boats is more highly developed than in almost any other large area. Rice culture helps to bring this about not merely because it demands many canals, but because it floods the lands and makes it difficult to maintain roads and the innumerable bridges that they would require.

South of the Yangtse the resemblances to Japan are greater than to the north, even though North China lies in the Japanese latitudes. The reason is that North China has very cold winters and a long dry season coincident with the cooler months. Japan and South China are alike in having enough rain and heat to keep the fields green practically all the year; they are also alike in their intimate mixture of mountains and little plains and in the abundance of trees wherever nature is left to her own devices. Nevertheless even in South China the hills are sadly denuded of trees, whereas in Japan this is rarely the case. Even as far south as Amoy, close to the tropic of Cancer, many a rough Chinese hillside, that might furnish abundant fuel and timber if protected, is so barren that the Chinese grub up the grass by the roots in order to get any fuel whatever. Thereby, of course, they make matters far worse, for the rains wash away the finer soil, and the result is little better than a desert. This is due partly to human folly, but even in South China long periods of dry weather in the cooler months place the trees under a greater handicap than in Japan.

Another condition wherein Japan resembles South China is the coarseness of the native grasses. This may sound like a small matter, but it largely explains why the work of preparing the fields and of carrying loads is performed by human labor more fully in Japan and South China than in any other regions where the degree of civilization is equally high. The same wet warm climate which makes rice culture far more common than in the north also causes the grasses to be so tough and watery that they provide very poor forage. Rice straw is indeed abun-

dant, but it is not much better. The water buffalo is the only beast of burden that really thrives on such a diet, but he is of little use outside the rice fields. Other beasts of burden can be raised only at such great expense that human labor is cheaper. In North China a better type of grasses, together with the straw of wheat and barley and the stalks of millet provide food that is good for horses, donkeys and ordinary cattle.

In order to sum up our ideas of the human geography of the Far East, let us think of Japan, South China and North China as forming a series arranged in the order of the excellence of their environment, their degree of progress, and many other essential qualities. These other qualities include the size of the people, the Japanese being the smallest. They also include freedom from extreme fluctuations of prosperity, especially those dependent upon crop failures and famines; friendliness, cheerfulness, and willingness to help others; readiness to adopt new customs and to throw off harmful ones such as footbinding and hara-kiri; ingenuity and originality in making inventions and developing new ideas; political sagacity and ability to run a government in which the people have some part, even if only a little. In all these respects Japan now leads the way; South China comes second; and North China brings up the rear.

CHAPTER XIII

THE CAUSES OF THE CONTRAST

MANY Americans and Europeans feel that the finest Chinese rival or surpass the Japanese in real ability. Whether this is true or not I cannot say, but great ability is by no means rare; one finds it among hundreds of thousands of Chinese as well as Japanese. Why, then, does China make progress so much more slowly than Japan? Why does footbinding persist in North China although rare in South China? Why has Japan a progressive industrial system; South China, especially the Yangtse Valley, the beginnings of such a system; and North China almost none of it? Why do great hordes of unemployed people present a scowling, truculent attitude in North China, in contrast to the smiling friendliness of happily occupied people in South China and extraordinary charm of manner in Japan? Why does North China consistently stand for reaction in government, religion, industry, commerce and social usages; while Japan leads in these respects, and South China hangs between the two? All these and a hundred other matters suggest deep-seated differences which the science of human geography can help to explain.

Here as in so many other problems, one school of thinkers turns at once to historical causes, to institutions, to the ideas evolved by the leaders, and to the type of training given to the young. The feudal system in Japan, the modifications of Buddhism introduced by Shintoism with its cult of loyalty, the greater contact of Japan with Europe, the conservative tendencies of Confucianism and ancestor worship in China, the

slow development of foreign trade, the paternalistic system of government, the lack of a sense of personal responsibility are given as causes of the contrasts that we have just outlined. True, but back of them certain great facts of geography provide a background which makes it much harder for the North Chinese than for the South Chinese to be progressive, and harder for the South Chinese than for the Japanese. If we would understand the problem aright, the proper method is first to analyse these physical factors and their effects; then we can rightly evaluate the social, political, religious, commercial, industrial and psychological factors. The trouble with much of our thinking is that we begin to construct our historical houses at the roof, and forget that there are any foundations, walls and beams.

It is very important to understand China and Japan aright. Together they contain fully a quarter of all the people in the world; both of them, especially China, are in a stage where development may be extremely rapid; our trade with them has grown by leaps and bounds — faster than with almost anyone else. Even if we combine South America with the whole of Africa and Australia, our total trade with those three continents only slightly exceeds our trade with Japan and China.

One of the most essential steps in understanding these highly important countries is to get rid of two widely prevalent misconceptions. The first is that China and Japan are backward because they have long been isolated. But from what have they been isolated? From Europe, doubtless, but the Europeans have been equally isolated from them. From India, but Europe has been still more so. They have certainly not been isolated from each other except by their own choice, nor from Chosen and Indo-China. They have been able to reach the East Indies and India more easily than the Scandinavians have

been able to reach the Mediterranean. It is only because we think in terms of European culture that we suppose China and Japan to have been isolated.

Take a map of the world. Suppose that you know nothing whatever about the civilization of different parts. Bear in mind that communication by water is far more easy and cheap than by land. Remember that though an occasional tropical typhoon is worse than any storm on the oceans in higher latitudes, the tropical oceans are free from storms many months in the year. Now put your finger on the region most easily in touch with a large number of other lands where the possibilities of development are great. Do you pick out Sicily in the center of the Mediterranean, or Borneo in the center of the marvelous East Indian archipelago with its fringe of continents? Or does your choice lie between Denmark and Chosen, with Cuba as another candidate? If you take into account the great river systems, some point like Amsterdam, Shanghai or New Orleans may get the palm. But certainly for mere accessibility from other regions, regardless of their civilization, it is hard to see how Europe has an advantage over eastern Asia. If lack of contact with Europe is the reason for the relative backwardness of the Oriental countries, why is it that India, after its long and intimate contact with England, Java after its similar contact with the Dutch, and Indo-China where the French have long been established, are so much less advanced than Japan where contact with foreigners has been far less common until about two generations ago?

The second misconception is that Japan has undergone a unique transformation since Admiral Perry first sailed up to Yokohama in 1853. Of course Japan has changed enormously, but not from an uncivilized to a civilized nation. Up to the time of the coming of the foreigners, Japan was indeed exclusive, but she was by no means stagnant. Read Japanese his-

tory and you will find that little by little, for one or two thousand years, Japan had been gradually evolving. She had not gone backward as had China; although she had had her ups and downs, she was still going ahead; even if no foreigners had come to her, the chances are that new developments would have taken place. So far as real civilization is concerned, Japan in 1860, let us say, was almost as advanced as England in 1760 when the Hanoverian kings were dominating her. She did indeed begin her industrial revolution later than western Europe. Therefore that revolution produced a more sudden change than in the West, but Japan was ready for the change and that is why she made it. In China a similar change has hung fire, and in India it has never been made except as Europeans have enforced it in spite of native indifference.

To return now to our main problem, even if European civilization had never introduced a complicating factor, Japan would apparently have been an energetic, progressive nation with its present qualities of love of beauty, loyalty, and reliance upon the advice of others. South China would have been less advanced than Japan, but progressive compared with North China; while North China would have been what most of it is today, a land poorer than either of the others, inhabited by people who are more conservative, less cheerful, less fond of art. Round about the borders of North China would have been a fourth area peopled by nomads with the boldness, physical energy and proneness to wander and plunder which are commonly characteristic of such nomads. The coming of Europeans has introduced a new factor, but it has not changed the general situation.

Three physical conditions have played an important part in bringing about this situation. The first is that Japan is an island. This has acted as a selective factor upon immigrants; it has enabled Japan to maintain a high degree of isolation and

so develop its culture undisturbed; and it has influenced the climate.

In studying the effect of the insular position of Japan upon the migrations which determined the original character of the Japanese, we have no exact facts and can merely reason from analogy. The importance of migrations in altering racial character is only beginning to be understood. Practically every migration is selective; the selection may be good or bad. When criminals or contract laborers are sent to a colony the selection is good for the home country, but bad for the colony. The same is true if the poor of the cities have their expenses paid to some far-off colony by the government, or are helped to go by steamship agents seeking to fill their ships. Although such types of migration have been common in recent generations, they are the rare exception when history as a whole is considered. In most migrations people either move from one region to another on their own initiative, or under compulsion. The longer and harder the migration, the more certain it is to be selective. This is true even if all the people of a community migrate together. The selection occurs in this way. No group of people, especially no primitive group, can migrate far without encountering physical hardships and human hostility. When the English first settled in Jamestown, nearly nine-tenths of the original settlers perished within the first few years; at Plymouth, half died during the first winter. When the Armenians were driven from their homes by the Turks after the Great War, three-fourths or more are estimated to have perished before they finally settled in other lands. The fatigues of the journey, the hunger which is sure to come, the sufferings from cold and heat, the ravages of enemies, the dangers from flood, storm, river, or ocean, all take their toll of lives. The first to die are the physically weak, especially those who

have organic diseases. With them perish the mentally deficient, and those who are so stupid that they exasperate their companions, or their enemies when taken captive.

The selective action of migration applies not only to the physique and intellect of the migrants, but to their temperament. A despondent temperament, the tendency to see only the difficulties and to hark back to the old home and its delights are great handicaps to survival. People of that kind are much less able to endure hardship than are those who look ahead courageously and plan for a happy future. The spirit of curiosity, on the contrary, buoys people up, while those to whom hardship is a welcome challenge may even rejoice in the chance to put their metal to the utmost test. The woman who is charming enough to make the men help her, and who is at the same time a good sport and a good comrade, is the one for whom shelter and food are provided, whose burdens are carried, and whose children are well fed. The baby which gaily laughs and tries to do its bit, or who simply begs for food in an endearing way instead of crying and making itself a nuisance is the one to whom the men are attracted, whom they are willing to carry in their arms, and for whom they are willing to sacrifice their own food. All these types of selection become more and more potent the longer and harder the journey.

All this appears to apply to the early inhabitants of Japan, just as it applies to England, Iceland and New Zealand. Each of these islands in the days when it received its original population, was the goal of a long and difficult migration. It may not have been very hard to cross the water from the mainland to either Japan or England, but it is highly probable that the people who finally did so had previously been battling their way toward the coast through all sorts of hardships and hostile-

ity. It is likewise probable that it was only the bolder, healthier and more adventurous spirits who finally crossed the sea to the new land, especially among the women.

If such people reach a land that is relatively uninhabited, or if they drive out the old inhabitants without mingling with them to any great extent, as appears to have happened when the Japanese drove out the Ainus, they have a great advantage. The stupid, the weak, the cowardly, the conservative, have been eliminated. Like must marry like, and the good qualities of the migrants are preserved. This is especially likely to happen if further migration is checked, as is notably illustrated in Iceland. After the first migrants have reached a new land and civilization has become established, further migration becomes relatively easy so that the degree of selection is not high. In Japan we do not know the extent of later immigration, but we are sure that there was very little for many centuries. Thus it appears probable that the island character of Japan not only exerted a highly beneficial selection on the early settlers, but provided comparative isolation so that the original qualities of the first settlers have been preserved, and civilization has been able to develop normally without the interruptions and set-backs due to repeated invasions and immigration.

In later times that same island character, together with the highly mountainous nature of the interior, has probably been an advantage because so large a portion of the Japanese have been compelled to live near the sea coast. That appears to be a real advantage from the point of view of health and energy, but it is also an advantage because such people become fishermen and go down to the sea in ships. In Japan this has been particularly easy because of the enormous number of bays and small islands arising from the drowned character of the shores. Fishing is a hard and dangerous mode of life. The coasts of Japan are stormy enough so that frequent accidents are bound

to occur. The proportion of the Japanese who have been seafaring people, and the percentage who have lost their lives, have probably been large enough to have a real effect in weeding out the men who are less alert in mind and body, less willing to obey at the word of command, and less able to take care of themselves in an emergency.

Abundant figures show that in maritime countries the death rate among young men at the ages when they first go to sea is very high, being higher than among young women of corresponding ages by about seventy-five per cent in Iceland and twenty-five per cent in Norway. In Japan, although no figures are available, there is every reason to think that similar conditions still prevail and were far more prevalent in earlier days when manufacturing had not developed, and fishing was an industry of relatively greater importance. To be sure, the selective effect upon the fishermen in Japan is by no means so great as in Iceland or Norway because the waters are not so cold and stormy, and voyages are not so long. Nevertheless, so far as this was a factor, it must have tended to make the Japanese alert and competent. Thus an initial selection of immigrants, and a later selection in every generation have combined with the effect of the island in maintaining isolation, thus permitting the Japanese to evolve their own culture, and maintain the characteristics with which they were originally endowed.

The next point to be considered is the direct effect of the climate upon health. This may be discussed briefly. Japan, as we have seen, is the only part of Asia which has a genuine cyclonic climate. Because of the long, warm, wet summers the conditions there are not so stimulating as in the North Sea region of Europe or in the northern United States; nor do they equal those on the Pacific Coast of the United States, and in New Zealand and the extreme southeastern part of Australia. Nevertheless, even in summer the monotony of the heat and

dampness in Japan is relieved by glorious days of blue sky and strong, cool winds following a storm. In winter, on the other hand, the climate is in many respects almost ideal — cool enough and stormy enough to be bracing, but not to do harm to health.

Turning now to China, one would expect the north to be more progressive than the south. Other regions within 30° to 40° of the equator are almost invariably more progressive than the neighboring regions lying in latitudes 25° to 30° . Yet in China, as we have already seen, the south is progressive, the north conservative. This arises partly from the peculiar climatic conditions. Although South China is distinctly tropical during the summer, its winter climate is better than that of almost any other region of similar latitude. This is because the extremely low temperature of Siberia causes strong cold winds to blow outward. These sometimes bring frosts as far south as Canton, and make even Hongkong on its island quite chilly. Nevertheless, the temperature is rarely low enough to produce serious consequences. The result is that although the summers are debilitating, the winters are stimulating; the only trouble being that they do not last long enough.

In North China the summers are nearly as bad as in South China, but nothing like so long. The winters, on the other hand, are very severe; temperatures below zero being frequent. The worst feature is the strong, dry, dust-laden winds. Numerous studies, as we have already explained, show that in winter as well as during all except the very hot weather of summer, continued dry weather is distinctly less healthful than that which is moister and more variable. Great dustiness added to great dryness is especially harmful. In North China the handicap thus arising is so heavy that the healthfulness and stimulating qualities are scarcely greater than in the south.

Let us turn next to the indirect effects of the Chinese climate.

Here the relation of North China to the deserts and plateaus farther north and west comes into play. In earlier chapters we have discussed the problem of historic pulsations of climate. We have seen that a change toward aridity may drive the people of the deserts outward in great migrations. A change toward greater rainfall with heavier snows may produce a similar effect upon people like the Tibetans who live in high plateaus.

The part of the world where climatic pulsations appear to have had most effect upon men during historic times is the dry regions of Asia from the borders of Manchuria westward to the Mediterranean. New and highly convincing facts along this line have lately been added to our store of knowledge by Professors Berkey and Morris as a result of their work with the Andrews' expeditions for the American Museum of Natural History. Their work, like that of their predecessors, makes it clear that during historic times a constant series of climatic pulsations large and small has taken place, and has driven the people of the deserts and plateaus outward again and again. The Great Wall of China, as we have seen, was built something more than two hundred years before Christ in order to check such migrations at a time of rapidly increasing aridity. But no human wall is able to check the forces of nature. Whenever their land has been unusually dry, the nomads have swooped down upon China in great hordes, or else have trickled through the wall in small bodies time after time.

One result of this is that North China has been ruled by foreign dynasties during practically half of the last two thousand years. The regular sequence in Chinese history is, first, a period of domination by northern or western foreigners like the Manchus; then a period of anarchy like the early decades of the present century; and finally a southern dynasty. After a period of quiet, which may last decades or centuries, another invasion occurs, coming from the north like that of the Mon-

gols, or from the west like that which established a Tibetan dynasty.

Such migrations are bound to have a great effect upon the racial composition and social organization of the people. Institutions, customs, cities which have grown up during long periods of painful effort may be overthrown and perhaps destroyed in a day. Then a long, slow process of re-building has to begin once more. In addition to this, such migrations almost always dispossess a considerable number of people, and drive them forth as wanderers.

It is probably no exaggeration to say that during the last two thousand years, hundreds of millions of people in North China have been compelled to change their homes by reason of migrations from the north and west. Whether the people who move out are of higher or lower caliber than those who come in, is open to question. The invaders on the whole appear to have been relatively competent, for pastoral nomads must be vigorous, alert and resourceful in order to survive. They must possess the power of leadership and coöperation or else they are eliminated in the struggle for existence. That is one reason why nomadic invaders coming into China or almost any other country are generally able to impose themselves as a ruling class. It is quite probable, however, that the people whom they displace are among the most able of the former population. In the fighting it is naturally the brave and courageous who are killed, while the cowardly run away and hide. Then when the new people have imposed their rule and taken the land into their possession, it is the old landowners and aristocracy who are most likely to be forced to wander away to other parts of the world. Such seems to have been the case in China. The wanderers went south into the Yangtse Valley. Some went up the Yangtse to the province of Szechuan in the famous Red Basin, and others southward into the hilly country as far as

Canton and the coast. Such migrations seem to be the main reason why the Chinese of the south are more purely Chinese than those of the north. They are also a main reason for the progressive and competent quality of the Chinese of the south.

The last physical factor which seems to have differentiated North China from South China, and still more from Japan, is famines. North China is peculiarly unfortunate because it combines highly irregular climatic conditions with a topography extremely favorable to floods. The climatic difficulty is that the rainfall is extremely seasonal and extremely irregular. In North China most of the rain comes during the months from June to September. During that season it falls heavily. Because of the long dry winters the mountains, even if left alone by man, are only imperfectly covered with vegetation and do not hold the rain very well. Since the mountains are steep, the rain runs off still more rapidly. Thus even under the best conditions, the floods are likely to be extreme. The Chinese have made the matter much worse by ruthlessly cutting off the trees. Thus the annual floods during the summer are always of large dimensions. Moreover, the water is very muddy and therefore deposits large amounts of material in its bed as it flows through the lowlands.

Normally as soon as a river raises its bed, it breaks loose and flows somewhere else. That is what makes alluvial plains so vast and so flat. As soon as the rivers are confined artificially by dikes, the stream beds rise higher and higher, and the dikes have to be raised accordingly; as has happened to our own Mississippi. There seems to be no visible end to disasters like the flood of 1927 unless we provide definite means whereby the river, after a certain length of time, may change its course and build up some other part of its flood plain. In China the situation is rendered worse because the summer rains

are sometimes tremendously heavy, so heavy that they actually flood the lower depressions in the gently swelling plains to a depth of several feet even if the rivers do not spill over. Then when the rivers break loose, the conditions are indescribable.

During the year 1927, the United States was horrified by a tremendous flood of the Mississippi River which inundated twenty thousand square miles, or as much as Massachusetts, Connecticut and New Jersey combined. It damaged property to an extent estimated at anywhere from two hundred million to a billion dollars. Worst of all it drove nearly three-quarters of a million people from their homes, and compelled six hundred thousand of them to depend on the Red Cross. Anyone who read the papers at that time knows how huge the calamity seemed. They know how the resources of the whole nation were called upon. The Red Cross sent its people there; the Army was ordered to help; the national government sent agents and so did state governments. There was a strong demand for a special session of Congress in order to provide relief for the sufferers. When the flood was over, the population in the afflicted towns was different from what it had been before. In most cases it was smaller, for some of the people did not return to their old homes. Just what the ultimate selective effect will be is not yet clear. In some cases the industrial workers in the small cities failed to return. Having found work elsewhere they saw nothing to tempt them back, for the industries in the flood area were prostrate. Most of the small landowners apparently went back, as did a large part of the huge army of colored tenants. In the case of the large landowners, however, the case is not so clear. The men indeed, went back, at least temporarily, to get their land under cultivation once more, but a well-to-do family which had been driven from its home and had become established elsewhere is likely to remain away for

some time and perhaps permanently rather than run the risk of again enduring the horrors of flood.

If the Mississippi Flood had occurred in China, it would have been considered a small affair. America would scarcely have heard of it. Those who have studied the problem say that somewhere in China, mainly in North China, a flood which affects as many people as our Mississippi flood of 1927 occurs every two or three years. Once in a decade or so floods afflict millions of people, the number sometimes running up to thirty, forty or fifty millions. Suppose that our Mississippi flood had been ten times as bad as it was; then it would have been no worse for us than the Chinese floods are for them. But the poor Chinese have no powerful government behind them; they cannot draw on the sympathy, wealth and active coöperation of the richest nation in the world; they have few railroads and no big fleet of power-driven river boats and launches to take care of them; only within a few years have they even had a Famine Relief Commission and a Red Cross run by foreigners.

Even yet the full tale is not before us. China suffers from famines due not only to floods, but to droughts. A famine due to drought often arises not because of lack of rain, but because the rain comes too late to permit the crops to develop. Sometimes such a drought may be followed by flood, and very often a drought one year is followed by a flood the next. Frequently the droughts last several years. Then a famine affects far larger areas than in the case of floods, so that sometimes a hundred million people suffer at one time.

Space forbids us to enter into all the ramifications of the effect of famines. In brief, the case is this. When a famine is due to drought, the people who hold a good economic position may not suffer for some time. The price of food goes up, but there is no sudden disaster. Those who are thrifty, economical and foresighted, suffer relatively little. Thus the selective

effect of famines due to drought may be highly beneficial, for it weeds out the persons who are wasteful, who are so lacking in self-control that they eat up their supplies in a hurry, or who are unthrifty and fail to lay by as much as possible for the future. Such famines must also weed out a great many who are constitutionally weak in either body or mind. They likewise put a premium not only upon the ability to endure long periods of scanty food, but upon many fine qualities such as thrift and economy.

If this were the whole story, China's case might not be so bad. But in a dry famine which lasts several years and in most of the wet famines due to flood, the people of large areas are ultimately forced to leave their homes, no matter how thrifty, economical and well-to-do they may be. When that happens, a wholly different kind of selection appears to take place. Suppose such a famine had begun to rage in your district; your business was dead, your savings were yielding little or nothing; and prices were soaring. What would you do? If you are intelligent, you would probably say that the best thing to do is to get out while the going is good. Get ahead of the crowd and go far enough so that the crowd will never catch up. You might go to the city, thinking to get a job there before the crowd came and there were twenty applicants for every job. You might go to some distant province where there had been no flood or drought. These courses are just the ones that the more intelligent and thrifty Chinese pursue. Of course the Chinese are bound to their homes more strongly than we are; their ancestor worship takes them back in a way unknown among us. Nevertheless, the Chinese migrate in vast numbers and for long distances. During every one of the greater famines, millions of people wander forth, some to go purposively to places where they can get a living, others to wander hopelessly hither and thither like flotsam on a stormy sea.



PLATE XXI. MARKET SCENE IN THE FAR WEST OF CHINA.

This scene is located at Kashi, where a river forms a large oasis on the edge of the desert of Chinese Turkestan.



PLATE XXII. RICE HARVEST IN JAPAN.

Is the charm of the Japanese women the result of some special form of racial selection? Or is it due to some unknown force which grades evolution regardless of environment? (Courtesy Asia Magazine.)

When a famine is over, who comes back to the old homes? The first to come are the poorest. They have not found work in the cities; they have lacked the wisdom and initiative to go far away; their one great yearning is to get back to the land that has fed them. But often their land has become salty by reason of the evaporation of the water from it, or sandy because the river has deposited new material. Under any circumstances, it is not likely at first to yield such good crops as formerly. Moreover, new houses have to be built and the difficulties of life are great. Therefore only the poorest and least competent who cannot do anything else bring back their families immediately. Little by little the others return, but a certain proportion who are especially skilled in handicrafts or otherwise, or who have gone far away, or feel well established in new and favorable positions, never come back. The most competent of all may indeed come back, for they are the large landowners. Naturally they do not abandon their property, even though they may leave their families in the cities for a while. Nevertheless, each great famine means the loss of some of the more competent people. Part of them re-enforce the cities, but the descendants of such people tend to die out because of high death rates and low birth rates which are characteristic of cities. Others strengthen distant regions such as the Red Basin of Szechuan or the southern regions where famines are rare. But the poor famine regions tend more and more to be populated mainly by a vast mass of stupid and inefficient peasantry, controlled but not leavened by an efficient though small group of landowning aristocrats.

Many other phases of this great problem are most fascinating. Enough has been said, however, to show that geographic conditions go far toward explaining the present status of China and Japan. In both countries, but especially in Japan and South China, the rice-raising type of culture is the foundation,

for there it reaches its highest development. Japan, by reason of its island character, has the advantage not only of a highly selected body of immigrants at first, but of relative freedom from immigration or disturbance so that the early qualities of activity, adaptability and initiative have been preserved. A climate much more invigorating than that of most parts of Asia has also helped in this direction.

South China is handicapped by the fact that its climate is somewhat enervating, but because of the cool winters it is not so enervating as other climates in the same latitude. It has been the gainer through selective immigration arising not only by reason of barbaric invasions of the north, but by another product of climatic pulsations in the form of famines.

North China has suffered terribly because it has been the world's greatest seat of famines. The famines may have made the people physically tough and mentally thrifty and economical, but they have also caused an alarming proportion of them to be dull, conservative and inefficient by driving away those with the opposite qualities. They have thus tended to convert the population into a vast and incompetent peasantry with only a small sprinkling of competent, landowning aristocrats.

And lastly, the desert regions of the cold plateaus have harbored a nomadic population which has constantly been driven into China by climatic pulsations. How far or in what way such migrations have changed the character of the nomad population we do not know, but certainly the coming of the nomads has had a tremendous effect upon China, especially upon the north.

CHAPTER XIV

THE CIVILIZATION OF EUROPE

IN our study of the earth's decrees, we have examined several types of human culture, each based upon some special aspect of nature. In Europe we find still another, wheat culture, which culminates in the manufacturing type of civilization. In order to see just where this stands let us recall the nature of the other types. We began with the hunting and fishing type based solely on wild animals. It still prevails in vast regions, but only where the climate is as yet too cold, too dry, or too warm and moist to permit any other mode of life except fishing or mining. We then passed to pastoral nomadism, another form of human culture dependent solely upon animals, but upon those that have been domesticated. This prevails in enormous tracts where the climate favors an abundant growth of grass, but is too cool or dry for agriculture except in certain spots such as oases. Like the hunting type, it necessitates frequent migrations and thus dooms its people to a low stage of civilization. Equally fatal to progress is the low mode of tropical life known as hoe or tree culture, wherein people rely almost wholly upon the fruits of trees like the banana and coconut, or upon roots like the yam which can be cultivated with a minimum of labor among the trees and bushes. This likewise occupies vast areas, so that these three lowest types, together with the uninhabited lands, claim fully two-thirds of the earth's land surface. All these are so handicapped by their environment that they have never produced anything which can really be called civilization.

Above these in the scale of progress come four main types of culture based on cereals, millet in Africa, corn in pre-Columbian America, rice in southeastern Asia, and wheat in western Asia, Europe, and the middle latitudes of modern America. Each of these four cereals thrives best in a different physical environment so that the degree to which man is able to advance varies greatly. We have already seen why people who raise rice stand far ahead of other tropical people. The raisers of corn likewise rose to a fairly high level in America before the days of the white man. They might have surpassed the rice people had they not been prevented from advancing into the best climates by reasons which we shall explain in the next chapter.

The millet type of human culture has never achieved anything noteworthy. Millet includes a number of species; the sorghums, for example, are large and cornlike except that the small grains grow on the head instead of in ears; other less important types are smaller and wheatlike. One or another of these will grow in almost any moderately warm region, but millet assumes an important place only in regions where there is a long hot period and only a short or very irregular wet season. Elsewhere people raise something else. In Africa millet is the staple crop of the border regions between the pastoral part of the Sudan and the more equatorial regions where hoe and tree culture prevail. It is also a main source of food on the southern margin of the tropical belt of Africa, where rain falls only for a short time when the sun is highest, and in corresponding parts of the Indian Peninsula and in the parts of North China where a delay in the summer rains most frequently brings dangerous droughts. The millet people are especially handicapped not only because the millets are generally less nutritious than the other major cereals and are raised mainly where the climate is unstimulating, but because the cli-

mate is also especially unreliable. That indeed is the reason why millet is used, for if a sufficiency of rain is assured, some better crop is almost certain to be substituted. Thus wherever millet is the main crop, progress is almost always subject to the heavy handicap of frequent and severe droughts which produce terrible famines, as we have already seen in China.

Wheat culture presents quite a different situation, for in almost every respect the regions where it thrives have peculiar advantages. Let us begin far back and examine the geographical conditions which have moulded the progress of this type of culture from its primitive beginnings to its culmination in the modern industrial type of civilization. Wheat must not be considered alone, for it is merely the best of a group of cereals all of which require the same methods of cultivation. All the others thrive in the climate best suited for wheat, but will grow well under certain conditions which are unfavorable for wheat. Thus barley and some of the smaller millets can be substituted for wheat in regions too dry for the better cereal. If the wheat farmer migrates into regions too cold for his old standby, he can cultivate rye or oats without having to change his methods to any appreciable extent. In places where the soil is poor, either barley or rye, according to the climate, can take the place of wheat. Thus as soon as people learned how to raise wheat or barley they possessed a technique which made it possible for them easily to make a living in vast areas of widely varying types. In addition to this, wheat, barley and even rye can be grown as either winter or spring crops which greatly enlarges the climatic areas to which they are adapted. Wheat and barley are both natives of the Mediterranean type of climate, wild wheat being now found in Palestine. Thus they are primarily adjusted to a climate where the seeds germinate when the autumn rains begin in September, October or Novem-

ber, after the long dry summer. Although the growth of the seedlings is checked during the cooler months, it is by no means stopped, for frost and snow are only temporary. When the weather begins to become warm in the spring they make a rapid growth and mature their seed by the time the dry season comes on, which may be anywhere from April to June. Suppose that the seed which then ripens is not allowed to sprout in the rains of the following autumn, but is carried north to a climate where the winters are cold and snowy. It can be planted in the spring and will ripen its grain in the fall. Thus it becomes spring wheat instead of winter wheat, and the range of climate where it can be grown is vastly enlarged.

Still another important fact is that the climate where wheat is indigenous is more healthful and stimulating than are the more tropical or sub-tropical climates which appear to have been the original homes of rice, corn and millet. Moreover, although we do not know exactly when or where the cultivation of wheat and barley began, we are almost certain that both events occurred in some eastern Mediterranean land so long ago that the climate much of the time for several thousand years thereafter was stormier and more stimulating than at present. Thus, although the first wheat people doubtless lived in a fairly warm climate with a pronounced dry season in summer, they had the advantage not only of a climate more energizing than that of the rice, corn or millet people, but of a mode of life easily capable of being expanded northward into still more stimulating climates as fast as man learned to overcome the handicaps of low temperature, grasslands and forests.

Before any type of human culture can spread abroad, it must develop its own technique, that is, its methods of work, of government, of training for the young, and the like. The environment taken in conjunction with the nature of the main crop has an enormous influence in this respect, as we saw in

our study of rice. Suppose that you were a primitive, flint-using hunter to whose highly original mind there came the revolutionary idea of assuring to yourself and your children a large and permanent supply of nutritious food by raising some of the seeds that you had been in the habit of gathering in small quantities by laborious search for the wild plants. If you happened to live in a prairie region you would soon give up in despair. A few experiments would convince you that it is useless to plant wheat in the midst of grass. Even if you burn off all the grass, its roots will sprout more speedily than your seed and will choke most of the seedlings. In the forest you might find that your seeds would produce nothing in the shade, but would grow quite well if dropped into little holes in some chance open spaces. Nevertheless the return for your labor would be discouragingly small because even the largest natural clearings would be of insignificant size, and any that you might make with your crude stone tools at that stage of development would not amount to much. Moreover, even if you had a good clearing and could keep it free from trees, you could not prevent it from turning into grassland, for you have neither animals wherewith to plow the sod, nor good iron tools wherewith to dig it. But suppose you live near a river and in a climate and a topography such that great floods inundate the land at certain seasons, but disappear in due time and leave large tracts of land soaked with water and covered with mud. If the floods are followed by a warm dry season, few trees will grow in such places; almost the only other vegetation will be grasses growing in clumps which can easily be rooted up by hand. Sow your seed there in the wet earth as soon as the floods retire, and you can get a good crop year after year.

When you have gone thus far in making use of natural irrigation, you discover that something more is needed. In order to prevent your crop from getting too dry before it is mature,

you may find it expedient to build a wall of mud somewhere upstream from your field, and make a reservoir, or divert some water from the river. Then by making little walls around your field and digging a ditch in just the right way, you can give the crop a second watering. If you do that, you may find yourself going farther and constructing a more elaborate system of embankments, ditches, mud dikes, terraced fields and pumping devices. You will also find that it pays to clear the land of weeds before the flood comes. All this will make you want definite boundaries which others will respect, and therefore you will become an advocate of law, order, government. Moreover, you will have to stay by your fields a good deal of the time. If you go off to hunt or to take care of cattle, wild animals will eat your young field or lie down and roll in it. When the grain is ripening, not only they but many birds and some of the wild men round about who do not yet practice agriculture will be only too glad to eat the crop as fast as possible. But mere watching is not enough; you must gather the ripe grain before it falls from the heads and is lost. So you must evolve a technique for harvesting the crop as fast as possible and must have the help of your whole family. Then you must devise a method of threshing the grain, storing it, and protecting it from rain and rodents, insects and bacteria. The longer the dry or cold part of the year, the easier this is.

Even the poorest grains are more easily preserved than fruits, vegetables or roots, but wheat is almost the best of all kinds of food in this respect, not only because of its hardness but because of the relatively dry cool climates where it is raised. The advantages of the wheat raisers in storing their grain do them little good unless they protect their food supply from human thieves as well as from rain, rust and rodents. So you, as a primitive wheat raiser, acquire another potent reason for

evolving a stable, civilized social system with property lines which need to be marked and recorded, with a regular system as to the digging of ditches and the parcelling out of the water, and with people whose duty it is to prevent theft and preserve the established order.

But what does all this mean? Already we are establishing a rather complex civilization with the necessity for written records, geometrical means of laying out boundaries, a system of public works and police, and the necessity for paying taxes in order to recompense the people who do public work. We seem to be ages removed from the primitive hunter or even the pastoral nomad. We are face to face with the potency of agriculture, especially the irrigation type, to compel men to become civilized. Only in certain highly limited types of environment was this development possible. Here are the requisites: — a climate right for wheat, barley, rice, corn or millet; a flood-plain; floods of the type that bring down mud and do not encourage the growth of trees; a warm period after the floods subside to enable the grain to grow quickly; a dry period when the grain approaches maturity so that it may ripen properly and be harvested and stored without loss. These requisites might be met by a small flood plain, but a large one is far better. If the primitive farmers with whom we are identifying ourselves live beside small streams they are often hampered because they are still in close contact with wild hunters or pastoral nomads who raid them unmercifully and steal their hard-won crops. The ravages of beasts and birds are correspondingly severe, for what wild pig or pigeon would refrain from gorging itself where grain is so abundant? Even in our day the isolated farmer often suffers heavily from just such causes. But if the flood plain is large, the irrigators will be able to protect themselves from marauders both human and animal; those in the center will be protected by those on the outside, but they will soon

realize that they must help the outsiders or themselves soon be exposed to ravages. That will join with irrigation and all the other factors in stimulating the people of the flood plains to frame an efficient type of government.

One of the most important phases of the great transition from other modes of life to agriculture based on cereals and irrigation is the selection which must inevitably occur, and the subsequent increase in the number of the people who choose the new mode of life. When people first began to settle in the flood plains we may be certain that it was not the conservatives who left the old mode of life and took up the new; it was not the stupid or those most prone to live from hand to mouth; it was not the physically weak or those especially averse to physical labor; nor was it those who were fondest of the chase and so successful in it that they rarely felt the pinch of want. Unless the men of those days were utterly different from those of today, the ones who took up the new discovery were progressive in temperament, thrifty and intelligent enough to plan far into the future, physically strong and not averse to labor, and perhaps socially-minded so that they liked to be near neighbors. When the children of such people were old enough to marry, *they must have married their own kind*, as a rule, because propinquity and similarity of social standards are dominant factors in determining marriage. Their children in turn must have been strongly endowed with similar qualities derived from both parents. Moreover, at first, for many generations while the new civilization was taking form, there must have been a highly selective reverse movement away from agriculture and back to hunting or pastoralism. It must have affected the people to whom physical work, steady or even intermittent industry, and submission to authority were irksome. Thus the innate characteristics of the agricultural population must have become different from those of the other groups and must

have been appropriate to a sedentary, industrious, law-abiding people.

In an earlier chapter we said that at any given stage of human development, the population tends to be about as dense as is compatible with the geographic environment. Before the advent of agriculture, ancient Egypt or Mesopotamia may have been able to support one hunter for every square mile; a few generations later the number may have been ten, twenty, or perchance a hundred times as great, depending on how rapidly the new art developed. But anyhow, it was many times as great. Were the additional people derived from the hunting or pastoral group outside the agricultural area? Not to any great extent, for that is not the way mankind behaves. When the economic basis of life is broadened, and when the conditions of nutrition and health are improved, as must have happened with the adoption of agriculture, the birthrate and especially the survival rate of children increase at once. When the early colonists came to America, they had very large families, larger than those of the corresponding classes of society in the old homes. Whenever people go to a new region where there are great opportunities for economic expansion the same thing occurs. This leads us to conclude that when agriculture was newly established, *the world's population undoubtedly experienced a rapid increase. The additional people were mainly the descendants of those who had chosen to practice the new art. Therefore they must have inherited an unusual degree of the mental and physical qualities which promote civilization.* Moreover, in the big flood plains the people of this kind were numerous enough and near enough together so that they stimulated and helped one another. Now we begin to see why treeless flood plains in fairly warm regions with long dry seasons have been the main centers of early civilization — the plains of the Nile, Euphrates, Tigris, Indus and Huang in the

Old World, and of a series of smaller streams in Peru and Mexico.

The geographical environment of the flood plains in the lands near the eastern Mediterranean gave the early raisers of wheat and barley certain advantages which need further explanation. One of the greatest advantages was the animals which they could domesticate. To us who live in a civilization dependent upon coal, steam and electricity, it is almost impossible to appreciate the importance of animals, not merely as a source of food, but still more as a source of power. In fact most of us fail to realize that because we run a vast number of machines by means of coal, petroleum, and water power, we multiply the work of each individual scores of times. If everything used in the construction and operation of your house had to be brought on men's backs, what kind of house could you afford, how much furniture, how many imported goods, and how great a variety of foods, ornaments and the like? Do you eat oranges? How much would a box of oranges cost if it had to come from Florida on the back of a human porter? Perhaps you have a tiled fireplace, costing a hundred dollars or so — the equivalent of the work of an unskilled laborer for twenty-five or thirty days. But suppose no machine had been used in digging the clay for the bricks and tiles, cutting the wood that borders the bricks, getting out the sand, lime and cement for the mortar, making the trowels, shovels, brooms, hammers and other tools that were used at one stage or another, or in bringing the various materials from a hundred miles in one direction, two hundred in another, fifty in a third, and two thousand in a fourth. Then how many days' work would it have cost? A hundred? A thousand? No one can tell, but the mere job of bringing the wood from the mountains of Oregon on a man's back would probably mean that you could not afford any such fireplace.

The main importance of domestic animals lies in the fact that aside from waterways they were the first great means of multiplying man's labors. Commerce could never be very active, on land at least, until loads were carried on the backs of animals. Nor could people travel far and frequently and thus obtain new ideas from other places until they could ride on animals, or else use waterways. In fact the ability to use both animals and waterways was doubtless one of the greatest factors in enabling early civilization to make such rapid progress in the great deltaic plains of Egypt and Mesopotamia. An even more important contribution of animals to civilization in the long run may have been that they made it possible to plow the land. That greatly increased the area that any one man could cultivate even in the flood plains, and thus gave surplus wealth and freedom wherewith to do such things as invent writing, find out how to measure land, use wheels for transportation, and make knives, spears, plows, and hoes of iron. Outside the flood plains the art of plowing did something still more important, for it enabled man to spread agriculture into grasslands and forests, and into the climates that are most stimulating.

What kind of animal is most useful to man? The best of all animals would possess the following qualities: its flesh would be good to eat; it would grow rapidly so that a small amount of forage would provide a large amount of meat; it would furnish abundant milk; its body would be covered with wool good for clothing, while a hairy mane and tail would furnish material for strings, tent cloth and the like; it would be big enough to carry a man with a little baggage, but not so big that its owner when traveling alone would have to give it much more food than would be needed for a beast just comfortably capable of doing the work; it would be able to endure all sorts of climates; it would be speedy; it would be high-spirited and not give up under difficulties; it would also be intelligent and tractable;

and it would have hard hoofs so that it could dig into the ground thereby getting the benefit of its full weight when it was used for plowing or other kinds of hauling. No animal possesses all these qualities. The horse comes nearest to the ideal; cattle, especially the European type, stand high, but lack intelligence and spirit; the donkey is good except that it is a trifle too small and is more stubborn than the horse; the camel is too big and stupid, it cannot pull well because its hoofs are not hard and it is adapted to only a small range of climate; the sheep, goat and llama are good from the standpoint of wool, milk, and hair, but are too small for riding and not very intelligent; the reindeer would be excellent if it were a little larger and were adapted to a wider range of climate, but its feet, like those of all beasts with cloven hoofs, are not so good for hauling as are those of the horse and donkey; the pig is useful for little except food. It is astonishing to see how few animals are really of much use to man, and how the horse stands out as preëminently the most valuable so far as the progress of civilization is concerned, while cattle in one form or another come next.

The geographic distribution of these few useful animals has given a great advantage to the people who started wheat culture east of the Mediterranean Sea. The hoe people have practically no domestic animals, not because they are not needed, but because the more valuable types do not thrive in their region by reason of the dense jungle, the coarseness, toughness, and scarcity of grasses, and the presence of harmful insects and bacteria. The corn people of ancient America likewise had no domestic animals aside from the llama in Peru and the dog and turkey elsewhere. The llama is one of the least useful animals in our list. The American bison, which represents the cattle genus in America, is too large, stupid and completely gregarious for domestication. Such conditions put the corn type of culture under a heavy handicap, as we shall see later.

The rice people fared better than the corn people, but the water buffalo, which is the main species of cattle in rice regions, is of little use outside wet fields. He cannot live far from the water, and at best is slow, stupid and often dangerous. The Indian and Javanese types of cattle are better, but are not so useful as the buffalo in the wet fields, and scarcely as good as European cattle for other purposes, especially milk. Unfortunately horses, donkeys, European cattle, sheep and goats, not to mention camels and the rest, do not thrive in the climates that are best for rice. The long, wet summers are bad for them, the coarse, tough, bulky grasses injure their delicate mouths and stomachs, and rice straw is not nutritious. The millet people fare better, for most of the more useful domestic animals can live in the main millet regions. Nevertheless the excessive dryness for long periods, followed by excessive moisture puts these animals at a disadvantage. Where millet is the main crop a fair number of cattle and pigs are likely to be found, unless the tsetse fly prevails, but other animals are generally few in numbers and of poor quality.

Among the wheat people the situation as to animals is very different. The regions where wheat was first cultivated are favorable to horses, donkeys, cattle, sheep, goats, water buffaloes and camels. The reason is not merely that the climate has a moderately cool season as well as a hot season and is neither extremely wet nor extremely dry, but that the grass which grows there is soft, fine and highly nutritious when dry as well as when fresh. The abundance of good animals enabled the wheat people to produce a surplus because they could plow the land, haul home their crops, and thus multiply their own labor far more than anywhere else. That enabled them to produce a correspondingly large surplus and broad basis for civilization. In conjunction with the openness of the Mediterranean countries, with their broad grassy expanses and few

trees, it made commerce and communication easy. This in itself must have given the wheat people a great advantage in the race of progress. Another important consideration is that in the early wheat regions for the first time we find animals of a kind that supply abundant milk as well as meat and that furnish valuable wool and soft, useful hair like that of the goat and camel, thus greatly increasing man's health and comfort.

In addition to all this, the qualities of the animals made it possible to take advantage of the fact that wheat and barley can be raised as spring crops as well as winter crops, and of the further fact that rye and oats as well as barley are cultivated in the same way as wheat. Being able to plow any kind of land when once the trees are removed, the wheat type of culture was able to migrate into more and more stimulating climates just as fast as the use of metals and the ability to keep warm increased man's power over forests and low temperature. Thus at the start the type of wheat and barley culture which was first possible on a large scale in Egypt and Mesopotamia had an advantage over other types of human culture, not only in irrigation which it shared with the rice and corn types; but in a more healthful and stimulating climate; better food because of the kinds of animals as well as the grain that it could use; greater opportunity to multiply man's power by means of animals as well as waterways and thus provide the surplus needed by civilization; greater power to engage in commerce and communication by reason of those same animals; greater power to spread agriculture beyond the immediate limits of the flood plains because the animals made it possible to plow the soil; and finally the power to move into other regions in response either to changes of climate or man's own changing ability to control nature. Thus when civilization finally moved into Europe that continent reaped the benefit of all the geographic circumstances which had combined to



PLATE XVIII HARBOR OF MALTA IN THE LINE OF COMPRESSION SOUTH OF EUROPE

This island may have been part of a bridge or of a series of stepping stones by which primitive man passed back and forth between Europe and Africa.



PLATE XXIV. RUSSIAN POST STATION IN THE REGION OF DIMINISHING HEALTH AND CIVILIZATION EAST OF EUROPE.

focus progress in the early wheat lands around the eastern Mediterranean.

Even yet we have not finished our catalogue of the advantages of Europe and of the way in which the geographic environment has helped to concentrate there the most rapid human progress. In order to understand the matter fully, we must turn to the purely human element, the process of improving the human inheritance of Europe, in distinction from the cultural inheritance.

It seems quite clear that the people of Europe, especially around the North Sea, stand unusually high in energy, inventiveness, adaptability and the spirit which makes people go ahead and do things. One of the reasons for this may perhaps be found in the origin of the European races. Aside from North America, no part of the world has suffered such extraordinary changes of climate as Europe. Twenty-five or thirty thousand years ago, and at several earlier periods, great sheets of ice covered regions where now the climate is the best in the world from the standpoint of human health and activity. At the same time the rest of Europe north of the Alps must have been so cold and stormy as to be almost uninhabitable. A repeated recurrence of such epochs, alternating with interglacial epochs when the climate was even milder than now, obviously rendered much of Europe first uninhabitable for tens of thousands of years and then even more habitable than at present. In the cold periods the inhabitants must have been largely driven out or exterminated; in the warm periods they must have increased in numbers and have migrated back again to the regions formerly occupied.

South of Europe in Africa and to the southeast in Asia lies the world's greatest series of deserts. We have already seen how great an effect has been produced upon the people of these deserts by climatic pulsations during historic times. The far

greater pulsations of the ice age, coincident with the advance and retreat of the ice in Europe, must have produced still more extensive migrations. When the ice was most extensive, much of the Sahara Desert, at least in its northern portion, was well watered and presumably an admirable home for mankind. The same was true in the deserts of Asia. At the height of the interglacial epochs, on the contrary, the desert conditions were apparently even more intense and widespread than at present. Thus in the deserts there must have been a constantly recurring tendency to drive people away when Europe was warm and hospitable, and to invite them when Europe was cold and raw. Climatic fluctuations did not come to an end with the retirement of the last ice sheet; between that time and the beginning of recorded history there is abundant evidence of climatic pulsations intermediate between those of the glacial period and those of historic times. Thus on a larger or smaller scale, and with varying degrees of intensity and duration, this pushing, pulling process has prevailed throughout practically the whole of man's existence.

It is easy to infer certain results of such extreme and persistent climatic variations. Between the deserts and the area covered by the ice sheets lies the Mediterranean region and its eastward extension in Mesopotamia, Asia Minor and Persia. That was the seat of the early wheat culture and of the greatest of all developments in human history. Perhaps the modern industrial revolution, and the knowledge of biology which has followed in the wake of the theory of evolution, may in due time produce equally revolutionary changes. Otherwise history probably offers nothing comparable to the great inventions and discoveries which took place in this Mediterranean and western Asiatic belt. There animals were domesticated; the plow and other appliances of agriculture were invented; there writing evolved to a higher degree than anywhere else; the me-

chanical arts received their first great impetus in such inventions as the wheel and its application to transportation, spinning and the grinding of corn. That too was the place where the world's greatest ideas in education, government, philosophy and religion originated. We of the present are merely meek followers in many of these matters. There early science made its greatest strides, while printing, architecture and sculpture flourished as nowhere else. Without disparaging the people of other lands and other regions, it seems fair to say that during the milleniums when civilization was making its first great advances, and even down to the time of Christ, the people of the Mediterranean belt and its Asiatic extension displayed an extraordinary degree of ability. Of course the wheat type of agriculture, with its favorable conditions for supplementing man's energy by that of animals, was an important factor. So too was the fact that the belt where all this occurred lies round about the Mediterranean Sea and its branches in such a way that communication by water is easy. Another favorable factor lay in the fact that most of the time in those days the belt of storminess presumably lay farther south than now, so that the climatic stimulus was great.

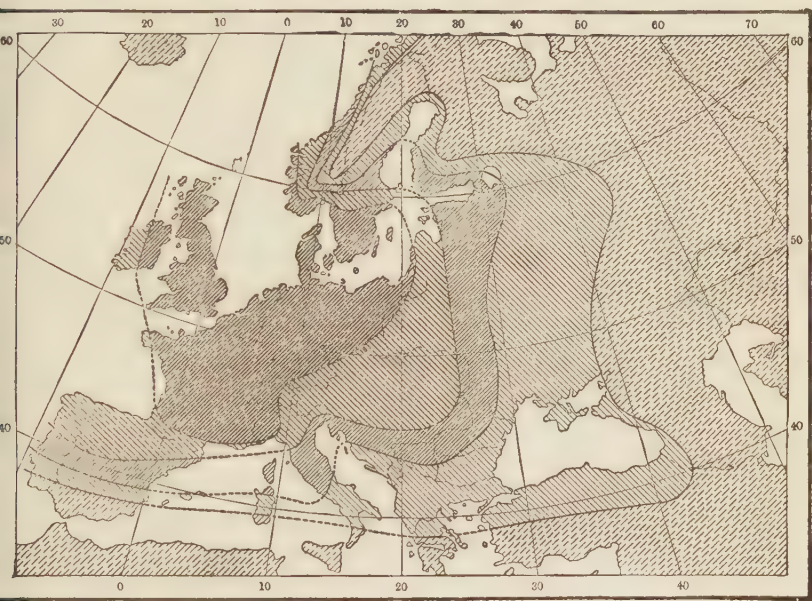
But behind all this lies still another factor. If we are right as to the power of migrations to eliminate the weak and preserve the strong, vigorous, adaptable and progressive, the Mediterranean-Asiatic belt must have been peculiarly blessed. It lies between the glacial regions of the northwest and the deserts of the southeast. Whenever the inhabitants were pushed out of one or the other of these regions, the Mediterranean region and western Asia must have formed a sort of zone of compression. Migrations, wars, suffering, and the drastic process of selection whose effects we have seen so often must have been the order of the day for thousands of years. There must also have been great mingling of races, for that is always the result

of migrations on any large scale. That would increase the opportunity for diversity and would therefore provide natural selection with more varied and valuable material upon which to work. The inevitable result would seem to be that the people who finally formed the population of that belt must have been an unusually competent and vigorous remnant, well able to take advantage of their environment and evolve the wheat type of civilization.

All this of course is inference, but it is based on a great many facts. The details indeed are obscure, but the general fact of constant migrations first one way and then the other, great mixture of races, and vigorous natural selection seems well assured. The inferred result corresponds exactly with what we find, namely, a people of uncommon vigor, just the sort among whom great discoveries and rapid progress would naturally arise.

Now take a step farther. In northwestern Europe the last period of habitability has been very short compared with man's entire existence. No longer than ten thousand years ago much of that region was either uninhabitable or else so stormy and inclement that few people could live there. With the amelioration of the climate, tribe after tribe moved in. They were still moving in vigorously in the early part of the Christian Era. Of course the movement was not all in one direction, for even if climate alone had been responsible, the movement would have been one way when the Asiatic deserts grew drier and Europe more favorable, and the other way when the reverse took place. Since other factors have also coöperated, the resultant movements have been extremely complex. Nevertheless, in general the tendency has been toward a northwestern migration. The migrants have included Celts, Teutons, Angles, Saxons, Norsemen, Goths, Vandals, Huns and Roman soldiers, but practically all have come from the belt of compression between the deserts of Africa and Asia and the cold lands of northern Europe and

eastern Siberia. In the course of these last migrations, a still further sifting has occurred. Thus the present people of north-western Europe represent the end result of a long, long process of migration and natural selection. It is only to be expected that they should display an extremely high degree of the qualities which tend to promote survival in times of stress, and



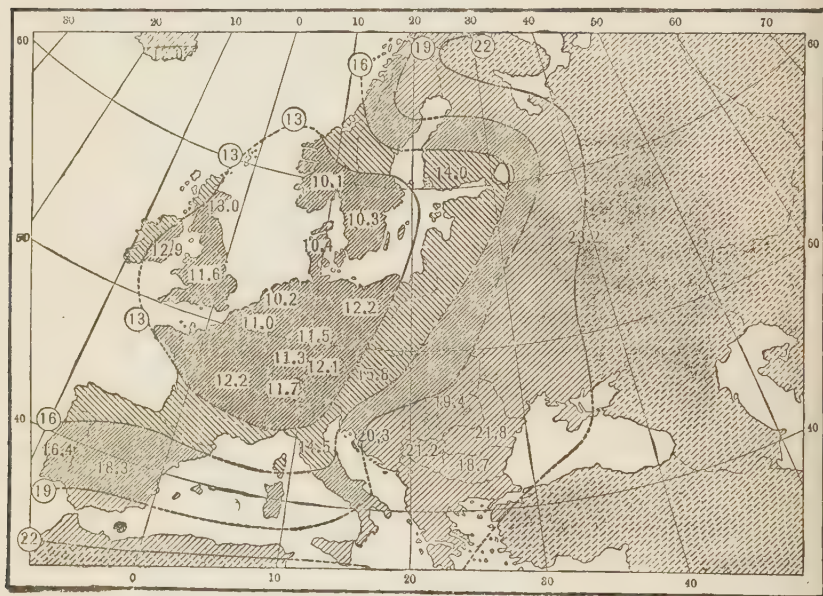
From "Business Geography." Courtesy of John Wiley and Sons.

FIG. 3. DISTRIBUTION OF CLIMATIC ENERGY IN EUROPE.

to cause civilization to make progress when the stress is removed.

So much for the people and for the type of civilization which came out of the Mediterranean and west Asiatic zone of compression. Now for the land into which the people and the culture migrated. It is perhaps the most highly favored part of the earth. The advantage most stressed in this book is climatic. It is summed up in Figure 3 which shows the distribu-

tion of climatic energy in Europe according to the same criteria used in constructing our map of climatic energy in the world as a whole. Notice the dark area surrounding the North Sea and including Great Britain, France, Germany, northern Italy, the three Scandinavian countries, Holland, Belgium and Switzerland. Turn now to Figure 4, showing the distribution of



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FIG. 4. DISTRIBUTION OF HEALTH IN EUROPE. (Based on the death rate.)

health in the various European countries. In all essential respects this map is like the other; there is the same dark area surrounding the North Sea, the same bulges toward Italy, toward the Black Sea, and along the Baltic. Even if abundant other evidence were not before us, these two maps would be enough to show that the distribution of health and energy is very closely dependent upon that of climate. Now compare

Figure 5 with the other two. This depicts the distribution of civilization according to the judgment of fifty well-informed people of many nationalities, as already described. Here again, the resemblance to the other three maps is so obvious that it suffices merely to point it out. The dark North Sea area and the three projections southeastward, eastward and northeast-



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FIG. 5. DISTRIBUTION OF CIVILIZATION IN EUROPE.

ward, are all there just as in the others. Obviously then, not only does Europe have well-nigh the finest and most stimulating climate in the whole world for people of our type of civilization, but the distribution of health and of progress agree with the climate just as we should expect. Thus after rigorous selection had presumably made the races of the zone of compression unusually competent, and had helped them to utilize the advan-

tages of Mesopotamia, Egypt, Greece and so forth, this same culture was bequeathed to a freshly selected group of people to whom was given the culminating advantage of the world's best climate.

On top of all these come two other advantages which might be called accidental were there really any such thing as accidents. One is that no great mass of land rivals Europe in the degree to which it is indented by deep arms of the sea, and is traversed by plains or lowlands so that one sea coast is easily accessible from another. No part of the area where the climate is most stimulating, as shown in Figure 3, is as much as three hundred miles from the ocean, and the greater part is much nearer. Thus great numbers of the sons of Europe have been trained by the power of the sea, and many of the weaker have been winnowed out. Because the sea coasts are so extensive, commerce is especially easy and the discovery of America exerted an extraordinarily stimulating effect, for this was the region whence America was most accessible.

Finally, the region where all the other conditions rank highest happens also to be a region where coal is especially abundant and accessible. We have already referred to the mistaken idea that coal is the *cause* of progress in manufacturing and of the present industrial supremacy of Europe. Coal is not the cause; Europe would probably hold nearly its present position in industry even if there were no coal. It would bring coal from elsewhere just as it brings "petrol," cotton, jute and the like. In fact, the supremacy of Europe in manufacturing was as decisive as now before the steam engine was invented, and when coal had no special value. What coal has done is merely to reinforce the commanding position bequeathed to Europe by other conditions of long standing.

Here then is the geographical explanation of the fact that the North Sea countries stand farther ahead in the path of progress than does any other part of the world unless it be the

manufacturing sections of America where another selective migration has brought Europe's children to another region of marvelous climate and abundant coal; (1) the great climatic fluctuations of the glacial period with their tremendous effect upon migrations, natural selection, and the evolution of the races in the belt of compression between the deserts and the ice sheets; (2) the type of vegetation and of animals which gave rise to the wheat type of culture with its dependence upon animals and its possibilities for increasing man's strength by using that of animals; (3) a most stimulating climate which could be utilized because the wheat type of agriculture adapts itself to the climates where man is physiologically at his best; (4) an unpopulated region into which selective migration was able to bring highly selected types of people in relatively recent times; (5) a peculiarly favorable conformation of land and sea, lowlands and highlands, and a peculiarly favorable position in reference to America; (6) an abundance of coal whereby, when the time came, man could still further increase his capacity to multiply his own energy.

Is it any wonder then that Europe still dominates the world? Is it surprising that the foreign commerce of the countries within the most stimulating climatic area of Europe, is as large as that of all the rest of the world combined? Is it any wonder that those same countries, together with their offspring in North America and Australia, possess three-fourths of the world's wealth, eleven-twelfths of the world's steamships, that they probably manufacture nine-tenths of the world's manufactured goods, and that they govern two-thirds of the world's habitable territory, and have a controlling voice in the development of most of the remainder? With such a marvelous combination of geographical advantages, it seems impossible that nature could decree anything except that when civilization had evolved far enough, the people of this region should dominate the world.

CHAPTER XV

AMERICA PRESENT AND PAST

WHY are the United States and Canada so different from Great Britain and Europe? Why are some parts of the United States and Canada so different from other parts? Why is the distribution of progress in these countries so different now from what it was before the days of Columbus? These three questions by no means embrace the whole of human geography. Yet complete answers to them would require a discussion of practically the entire subject. The answers depend largely upon the interplay of four great factors: first, selective migration; second, climate; third, resources; and fourth, stage of development.

Americans often pride themselves on their activity, alertness, progressiveness, and readiness to try something new. They seem to Europeans to be always boasting that everything of theirs is bigger, better, and more up-to-date than anywhere else. Is all this because the United States is new and young, and has not yet learned to do otherwise? It certainly seems to be true that the newer a region is the more likely its people are to be "boosters." Nowhere is this more evident than in the newly settled parts of Australia. But what about the fact that a similar spirit is obvious in China? In spite of the enormous difference between Great Britain and China, the gradual transition from conservatism to the pioneer type of progressiveness as one goes out into the more recently settled tracts is the same. From England go to Nova Scotia or New England, thence to Ontario or Illinois, and on to Alberta or Wyoming, and you will

find a change of character almost identical with what you will find in going from conservative Shantung to southern Manchuria, thence to central Manchuria and on to the north. The same type of contrast, although to a milder degree, follows the trail of Chinese migration from North China to South China, and then across the sea to Formosa, Java or Hawaii. It can be seen likewise if one goes with the Italian emigrants from Naples to Buenos Aires and then into the newer parts of Argentina. Even when one compares Bostonians who still live around Massachusetts Bay with those in New York, in Florida, and finally in China, Mexico, or equatorial regions, one likewise finds a progressively strong development of what are well called the characteristics of the pioneer.

Thus it appears that the contrasts with which we are now concerned are not due to either new lands or old lands in themselves, but to the selection arising from migration. As a general thing new lands are also remote and inaccessible, so that they are not reached from the old lands at a single bound. The usual method is for people to move into the nearest or most accessible region that suits them. Such movement, *when purely voluntary and unassisted*, involves a selection on the basis of health, optimism, the spirit of adventure and the like. It also involves financial and social selection, for the well-to-do, unless young and adventurous, are generally kept at home by their worldly position, while the poor, unless they are unusually enterprising, are kept at home by their poverty and by the inefficiency which commonly lies at the root of that poverty. After the migrants are established in their new homes, a later generation is likely to migrate once more, as from New England to Ohio and Illinois. Again selection takes place, although all of the selective factors need not necessarily be the same as before. When New England was settled the religious factor played one of the chief rôles; but when the sons of

New England began to go West, the economic motive was dominant. A generation or two later another similar migration and selection brought a new population to Iowa, Nebraska and the Dakotas. The last wave of all has done the same thing for Wyoming, Montana, and the Canadian Northwest. Each time the resultant population in the newest region has been more completely of the pioneer type than formerly. It is as if each migration put people through a sieve whose meshes more and more assume a peculiar shape.

Migration to new and unoccupied lands does not differ greatly from migration to any other place with fresh opportunities. Those are what count. They cause the young men and women who migrate from the country to the city to be sifted in much the same way as are the people who go from the older East to the newer West; and the same is true of the migrants to Florida during the boom of 1925. The California climate, a newly opened gold field, a tropical region with unusual opportunities for making a fortune are samples of the hundreds of conditions that lead to migration and selection. The city and the tropical country may indeed appeal mainly to the love of gain, while the new country and the remote mine may appeal still more to love of adventure, but that is a minor difference. Thus the outstanding difference between new countries like the United States and old countries like those of Europe is that the new countries contain a much larger proportion of the pioneer type of people, whose characteristics become more pronounced the more remote and new the country.

We who live in new countries are apt to glorify the pioneer type. Undoubtedly it possesses a high degree of vigor and energy, a strong spirit of progress and reform, and much of the "go-get-it" temperament which gives the United States the reputation of being dollar-mad. By no means all of these qualities are good, and it is doubtful whether most new countries re-

ceive their full proportion of people who are intellectual, artistic and highly cultured, or of those most competent to carry on the affairs of government. In many cases, indeed, a "new" country fails to get the most earnestly religious types unless there happens to be persecution. Of course the circumstances vary continually so that no generalization is universally true. Nevertheless, while a new country does usually obtain settlers endowed with unusual energy and initiative, its failure to obtain enough of the more thoughtful, artistic, literary, and cultured types is one of the chief reasons why it is so apt to seem young or even childish. Its people are so active that they often suppose energy to be a reasonable substitute for sound judgment, or wealth for culture. When looked at in this way the mere fact of migration and selection seems to account for a good deal of the difference between Europe and America, between the East and West in America, and between states like Florida and its neighbors.

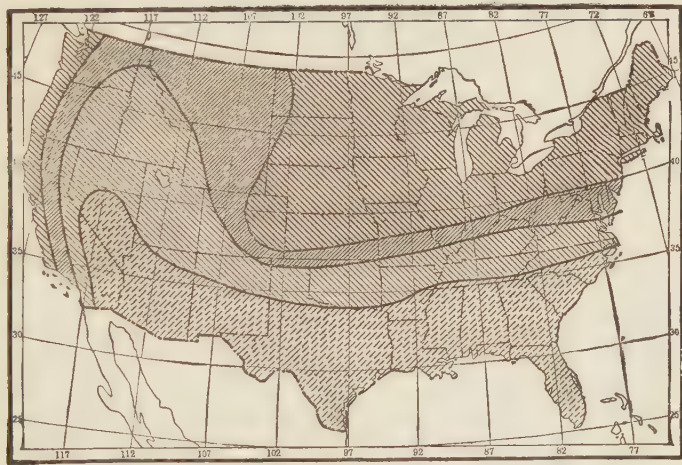
These facts seem to explain so much that one is tempted to inquire what remains for the other factors. So far as climate is concerned, part of the answer, for the United States at least, is found in the difference between the areas of highly stimulating and healthful climate in Europe compared with North America. The European area is excellent partly because the temperature and humidity stand close to the optimum for physical activity during several of the summer months. Only rarely is the weather hot enough, cold enough, or dry enough to be really harmful. The other main element in the excellence of the weather of the North Sea regions of Europe is the constant succession of storms, usually mild in character, but nevertheless bringing frequent stimulating changes. In the north-eastern United States the factors are a little different. Here as in the North Sea regions, there is a highly stimulating contrast of seasons, but with us the summers are likely to be too warm

and the winters too cold, while very dry spells may occur at all seasons, thus doing considerable harm. This happens largely because our main area of the best kind of climate lies on the eastern side of the continent, and the prevailing winds blow from the west, thus bringing the extremes which are characteristic of continental interiors and which are one of their great disadvantages. These disadvantages, as compared with Europe, are balanced more or less fully by the fact that our storms are more frequent and bring more pronounced changes of weather than do those of western Europe. That region has nothing to compare with our rarest days when a storm has just passed and a marvelous wind from the northwest brings the most crystal-clear of skies and combines with a temperature of sixty or seventy degrees to stimulate every nerve.

As to which of these two types of climate is the better, it is hard to say. I am inclined to give the palm to Europe, for the European climate favors a more steady and less nervous type of activity. There the mind and body of the person whose health is good are never swayed far above or below a reasonable level of activity, so far at least as the weather is concerned. It is therefore possible to work cheerfully, purposively and effectively day after day and month after month without exhaustion. With us the fluctuations are much greater both from season to season and day to day. We are pulled down by our winters, and often by our summers; our activity may be checked for a few days at almost any season by cold spells, warm spells, or extreme storms. To make up for this our best seasons, and our best days at almost any season, possess a stimulating power almost unknown elsewhere. Thus although our activity is often checked, it is also often spurred to the utmost. When such a stimulus is applied to people who have been selected because of their relatively alert and active temperaments, extreme or even undue activity and nervous energy

are almost inevitable, and action is in danger of outrunning judgment. We are likely to resemble the Filipino who described himself as having too much engine for his steering gear. That then is the handicap which we must face as a partial offset to our undoubted ability to put things over.

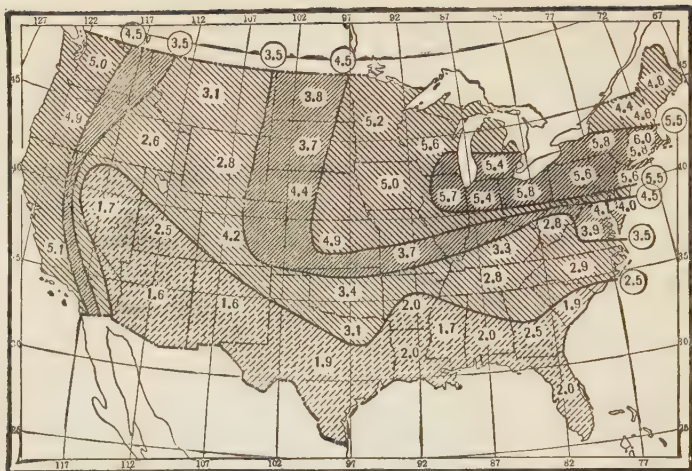
Now for the differences between one part of the country and another. Figures 6 and 7, which are like the corresponding



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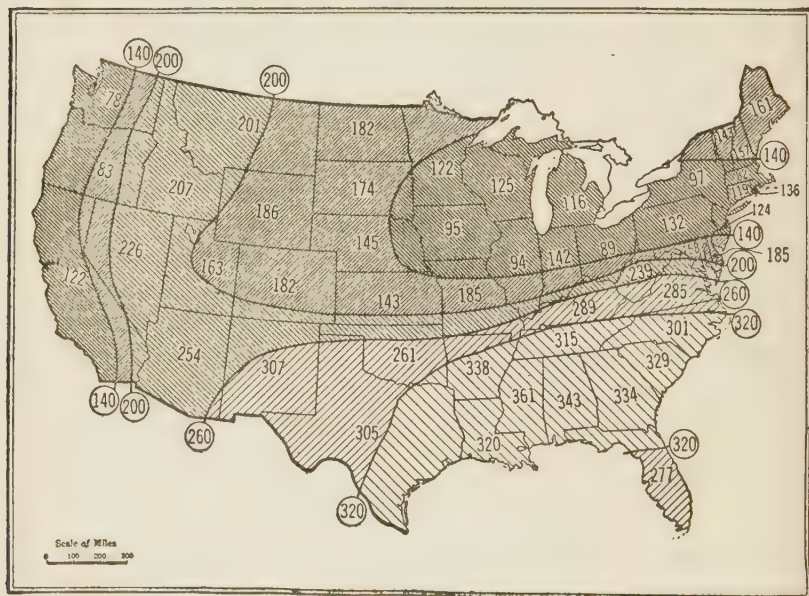
FIG. 6. DISTRIBUTION OF CLIMATIC ENERGY IN THE UNITED STATES.

maps of Europe and the world, show the close agreement between climatic energy and the degree of progress as estimated by a group of experts. Figure 8 allows us to test the opinion of these experts. It is a map of progress based on exact statistics selected so as to reflect the actual economic, social, educational and personal characteristics of the people as accurately as possible. Transportation facilities and income per capita have been selected to illustrate the purely economic conditions. In order to give each state a rank in transportation we find how many miles of railway there are for each square mile of ter-



From "Business Geography." Courtesy of John Wiley and Sons.

FIG. 7. DISTRIBUTION OF PROGRESS IN THE UNITED STATES PER EXPERT OPINION.



From "An Introduction to Sociology." Courtesy of D. C. Heath and Co.

FIG. 8. DISTRIBUTION OF PROGRESS IN THE UNITED STATES PER CENSUS STATISTICS.

ritory and each inhabitant, how much is spent per mile in maintaining the public roads, how many trolley cars per thousand people, and how many people for every automobile. When all these facts are put together by the proper mathematical methods, we can rank the states according to the ease with which one can travel within them, and can make a composite map illustrating transportation facilities. Southern New England and the states from Ohio to Iowa stand in the van. New York and Pennsylvania rank almost as well, but fall a trifle behind because of difficulties imposed by the Appalachian mountain system. The most backward states, on the other hand, are Alabama, Mississippi and Arkansas, and still more the whole tier of Rocky Mountain States with New Mexico at the bottom and Montana and Nevada next. The Pacific Coast stands high. The map as a whole looks surprisingly like a map of climatic energy, except that the Appalachian mountains and especially the Rockies introduce obstacles which even our system of transportation has not yet overcome.

For information as to income we rely on the estimates of the National Bureau of Economic Research. In 1919, 1920, and 1921 the average income per person in the United States ranged from \$263 in Mississippi to \$943 in New York state and \$909 in California. Except for Nevada, Wyoming and Colorado, which are high, and North Dakota which is low, the states rank very closely as in the maps of climatic energy (Figure 6) and progress according to the experts (Figure 7). The incomes in the South are depressed by the presence of the Negroes who are not separated in our statistics, but even without them the general aspect of the map would not be changed.

Let us look next at the distribution of social conditions as shown by the percentage of the people engaged in professional work and manufacturing. We have assumed that high percentages indicate progress. The range in the percentage en-

gaged in professions is great, from 7.7 in California to only 2.7 in Mississippi and South Carolina. Here again, the census data do not separate the colored people, and this tends to depress the southeastern states, but the presence of great numbers of foreign-born does the same in the northeast. Hence New York, which stands highest among the eastern states, is rivalled or surpassed by ten states lying west of the Mississippi, namely Iowa, Nebraska, the Dakotas, Colorado, Utah, Nevada, and the three states on the Pacific Coast. Manufacturing is quite different, for the regions from southern New England to Illinois are easily supreme. A map of manufacturing looks much like the maps of climatic energy and progress except that the Pacific Coast is not yet so much of a manufacturing region as one might expect from its other conditions. Mississippi and North Dakota stand at the bottom in manufacturing.

Although these economic and social conditions are an important element of progress, the education of the individual members of the population is still more important. We can test this by means of illiteracy and educational facilities. When colored and foreign-born persons are omitted, illiteracy is least prevalent in southern New England and in a triangle with its apex in Minnesota and its base along the whole Pacific Coast. The worst conditions are in the southeast, in practically the same place where Negroes are abundant even though the Negroes have been omitted. New Mexico, however, is still worse, presumably because of its large number of Mexicans who were born there and are counted as native whites.

Illiteracy is only a moderately good indication of progress because in newly settled regions such as our western triangle of low illiteracy, the education of the people depends on the places whence they came, not those where they now live. We want to know how well those same people maintain their educational facilities. In order to make this as accurate as possible let us

combine five different conditions. We will begin with the percentage of native white children seven to fourteen years of age who are actually enrolled in the schools. This is highest in the northwest where Utah and Idaho stand in the lead, and lowest in the southeast where Maryland and Georgia rank a little better than Louisiana. The frequency with which we find a contrast between the northwest and the southeast is interesting. Another good criterion of education is the young people eighteen years of age who have graduated from a high school. Maine, New Hampshire, Oregon and the neighboring states rank five or six times as well as Georgia, South Carolina and their neighbors. This great contrast occurs even though we have given the South the advantage of omitting the Negro population and assuming that all the High School graduates are whites. Another characteristic of the better school systems is that they are open for a large part of the year and the pupils are in regular attendance. The number of days when the average child is actually present ranges all the way from about a hundred and fifty per year in Massachusetts and New Jersey to only half as many in South Carolina and Mississippi.

How about the salaries of teachers? Contrary to general belief, the salaries are about the same in the northeast as in the far west, the highest averages for all the public school teachers in individual states being nearly thirteen hundred dollars in New Jersey and Massachusetts compared with fourteen hundred in Oregon and thirteen hundred in Washington. In the southeast the level is very low, with a minimum of less than three hundred in Mississippi and a little over four hundred in Georgia, but this includes colored teachers as well as white. Nevertheless the scale for the white teachers is lower in the South than anywhere else. Finally, one of the best indications of the effectiveness of a school system is the extent to which the boys as well as the girls keep on into the higher grades. Our

social system has departed so far from the ancient method where men alone were educated that now our girls often get more education than our boys. Maryland and Utah keep their boys the longest, while Wyoming, Montana and the Dakotas are the places where the boys are most likely to be out-distanced by the girls. When all these conditions are combined it appears that education is most advanced in the states from southern New England to Illinois, on the Pacific Coast, and in Utah. This last state illustrates the way in which a social institution may alter the results which one would expect on the basis of environment. The Mormons insist that their children shall be educated. Otherwise the map of education is almost identical with those of climatic energy and progress.

The systematic way in which most of our maps conform to the climatic map, or else to modifications of that map which are easily explained by migration and selection is becoming monotonous. But we must face it again when we attempt to estimate the personal qualities of our people. One intimately personal quality is health. Strange as it may seem this boastful country of ours is so backward that a reliable map of health based on official statistics is still impossible. Some states keep no such records, and in others, such as Mississippi, the records are doubtful. The records of insurance companies give a map of health which might almost be mistaken for the map of climatic energy except that farming states such as Iowa and Nebraska make a better showing than manufacturing states like New York and its neighbors.

As a final measure let us take something even more personal, namely the accuracy with which people answer the census questions as to age. This seems like a queer criterion. How does it measure people's ability, and how do we know whether they answer correctly? As a matter of fact it is an extremely good measure of general intelligence, and we can tell with great ac-

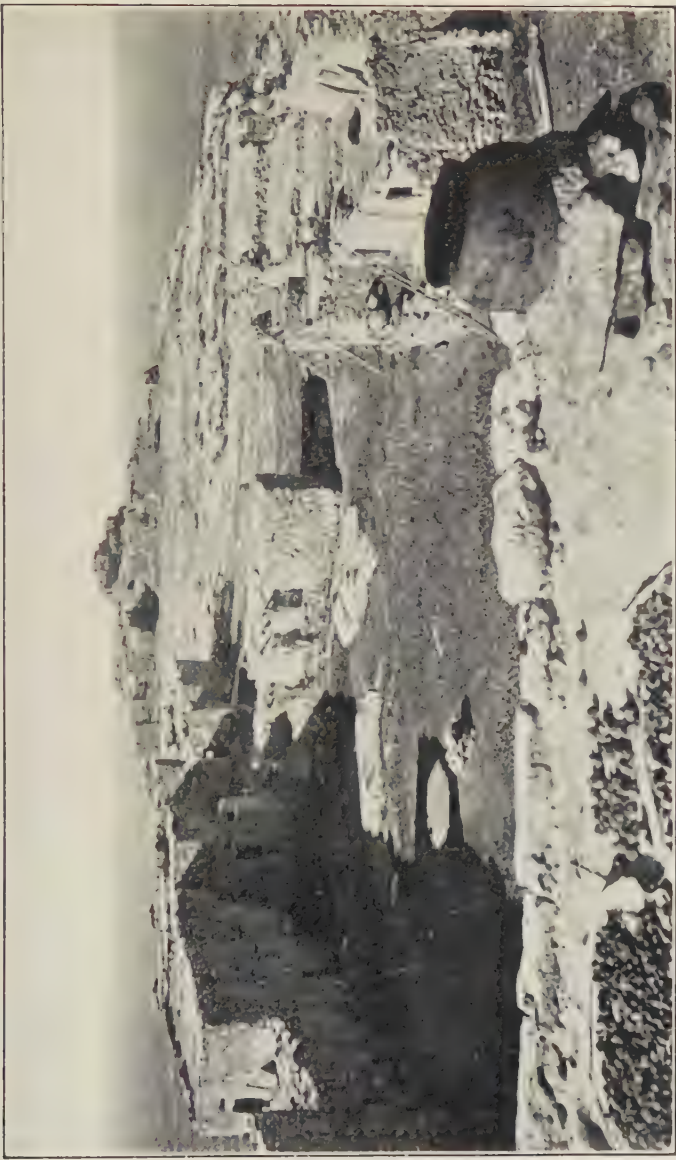


PLATE XXV. COOKING PLACE IN THE PUEBLO VILLAGE OF ZUNI.

A northern outpost of the ancient corn type of civilization which still hangs on in spite of aridity and the invasion of a new culture.

curacy how much error there is in the answers of thousands of people, although we cannot be sure with respect to any given individual. The matter works in this way: — If you are an intelligent, careful person the census-taker has no terrors for you. You give him the names and ages of all the people in the house with accuracy. If he is also intelligent and careful he makes sure that you understand everything and that he understands you. But suppose a careless census-taker is talking to a shiftless, ignorant mother or grandmother who looks upon him as a nuisance and perhaps even a menace. When she gives the names of the children she says that Austin is twelve when he is really thirteen, and forgets that Virginia's tenth birthday will not come till next month. When the man of the house comes home and she relates the day's experiences, she exclaims, "Good land, I clean forgot the baby. Did you ever hear the beat of that?" This is not mere imagination; it actually happens. Moreover, not a few census-takers think it too much trouble to go half a mile up a side road to get the facts about a house or two. They or their wives think they know all about it, but they get the ages wrong and have never heard that a new baby came four months ago.

If you want the proof of this look at the census tables and see whether the number of children decreases systematically with age. In any normal population those under one year of age must be more numerous than those between one and two, because from a tenth to a fifth of the babies usually die during the first year. In the same way the two-year olds must be more numerous than the three-year-olds, and so on. Again, children aged four, six, eight, ten and especially twelve — even ages — ought to be a little less numerous than those of the preceding odd ages — three, five, seven, nine, eleven and so on. According to the census neither of these conditions prevails in large parts of the United States. Babies almost never appear to be

quite as numerous as they really are; children of even ages, especially twelve, almost invariably appear to be more numerous than is warranted by the facts; the only odd age that gets a surplus is twenty-one, mainly among the boys because they want to vote while they are still twenty. In a high-grade population consisting largely of recent native-born migrants from the old states such errors are slight, as in Minnesota. In Mississippi, on the contrary, even the native whites of native parentage report more children at the ages of ten and twelve than at any other age. Ridiculous as it may be, the census figures would seem to indicate not merely that none of the infants ever die, but that the number of children born in 1910, let us say, has increased greatly by 1920. Then it drops ten per cent or so, and in 1922 again rises as high as in 1920. Of course this is the sheerest nonsense. It arises simply from the fact that the people as a whole, and likewise the census-takers, are so careless that perhaps a fifth of the children, even those who are native whites of native parentage, are not recorded in the census, and the ages of those who are there are often wrong.

Among foreign families and especially among Negroes these tendencies are still stronger. Among the Negroes of South Carolina the children twelve years of age are actually reported as forty or fifty per cent more numerous than those eleven years of age or than the babies under one year. Yet in Minnesota, among the native whites of native parentage, the twelve-year-olds are reported as a trifle less numerous than the eleven-year-olds, and the infants under one year of age exceed them by more than fifty per cent. Thus it appears that the census data as to age are one of the most delicate tests of the average intelligence of a population.

When we apply this test to the United States as a whole, but limit it to native whites of native parentage, we find a strip of

high intelligence and accuracy from southern New England to Oregon, including all the northern tier of states except northern New England. Maine falls off quite badly, perhaps because many of her more intelligent people have migrated away, and perhaps because the sparsity of her population causes the census-takers to do a great deal of guessing. In the southwest, California falls in the same class as New Hampshire and Vermont, but the other states stand somewhat lower. Nevada falls as low as Maine, perhaps because there too an unfavorable outward migration has occurred. The southeast brings up the rear, especially South Carolina, Louisiana and Mississippi, but Florida, by reason of recent immigration, rises to the level of New Hampshire and California.

When these eight methods of measuring progress are put together, as is explained in *An Introduction to Sociology*, the result is Figure 8. That map seems to me the best measure yet available of the degree of progress and intelligence in different parts of the United States. In spite of minor differences it resembles the map of progress according to the experts so closely that we feel assured of the general accuracy of the latter. But our map of progress on the basis of statistics is even more like the map of climatic energy. Thus by the most accurate tests yet available our main conclusions as to the intimate relations between climate, health, energy and progress are verified. Migrations may upset this pattern, but the extraordinary feature is that in a new country like the United States, where people are still moving actively from place to place, the general pattern of progress conforms almost perfectly to that of climate. This is partly because energetic people more or less unconsciously seek energizing climates, but it is also because with equal unconsciousness most people conform their degree of activity to the type of climate in which they live.

Although the direct effect of climate may determine the main lines of the distribution of progress, we must not overlook other factors such as the distribution of the Negroes, and the occurrence of upheavals like the Civil War. If there had never been any Negroes in the United States it is almost certain that the general aspect of Figure 8 would be essentially the same, but the shading of the southeast might be one degree lighter. But after all, the presence of the colored people and the occurrence of the war are closely connected with climate. Black slaves were originally brought to New England as well as the Carolinas, and nobody thought it wicked. In the North the slaves did not thrive because the climate was too cold for them; in the winter they spent most of their time shivering and trying to keep warm. In summer they did not work hard enough to be of much use in a region where the white man loved to work and did it very vigorously. As house servants the slaves were of some use, but not very good or cheap compared with the efficient white servants who could easily be brought over from England. In the South all this was different; the Negroes enjoyed life, had better health, and worked better because it was warm. The white man did not like to work so well as in the North and could not work so hard. Moreover, it was much cheaper to support a slave where the demands for clothing and shelter were so much less than in the North. More important still was the fact that in tobacco the South had found a highly profitable crop with a market much larger than the early colonists could fill. Negroes were just the people for such a crop, and so it paid to keep them. Then in later days, after the invention of the cotton gin, cotton supplied another highly profitable crop just fit for Negro labor.

To make a long story short, the climatic conditions gradually exerted their usual power of selection; they drew the Negroes to the South, but not to the North. They also selected a moral

idea for preservation in the North. In Europe the problem of whether slavery was right or wrong became acute before it did in America; the people opposed to slavery won because those to whom it was an economic advantage were few and not highly influential. In America the ideal of liberty and equality for all men thrived in the North where black men were of little use as slaves, but was forcibly rejected by the South. That is the way it often happens. An idea may originate anywhere, but in some environments it is nipped in the bud; in others it grows and bears fruit, even if that fruit is a devastating civil war. Thus while the contrasted climates of the North and South are not the direct causes of slavery and the Civil War, they are the reason why two opposing ideals were located within one country so that they had the opportunity to come into conflict.

One other phase of progress in America still remains to be considered. Is not a large part of what we have said about climate and civilization contradicted by the distribution of human progress among the Indians before the days of Columbus? Not at all. On the contrary, the adjustment between man and his environment was just as close then as at any other time and perhaps closer. In those old days there were three centers of progress among the Indian population of America. In one, the central feature was the corn type of agriculture. In another it was fishing and commerce, and in a third, war and government. One had its center in Guatemala and Mexico where the Mayas were its highest exponents; the second had its center among the Haidas in the Queen Charlotte Islands off the coast of British Columbia north of Vancouver Island; and the third among the Iroquois or Six Nations of the state of New York.

The relation between the cultivation of grains and human progress has been so fully explained that it is easy to see why the first and only really great civilization of America arose

where corn was cultivated. The cultivation of corn requires certain very distinctly limited climatic conditions. The corn seed will sprout properly only in a fairly high temperature and with a fair amount of water. The growing plants must have abundant moisture for two or three months, especially when the ears are making their first growth. After that a relatively dry season is needed, for otherwise a large part of the crop may be ruined.

We are so familiar with corn as the greatest crop of Iowa, Illinois and the other richest agricultural portions of the United States that we fail to realize that among the Indians it was almost impossible to grow corn there. Bear in mind that in North America the Indians had no domestic animals that could plow the land or even carry burdens to any appreciable extent. In addition to this they had no iron implements and practically none of copper. Thus no matter how high their cultivation might rise in other respects, it could not spread into grasslands and only very imperfectly into forests. Just why the greatest of all native American civilizations grew up in the lowlands of Guatemala rather than in the highlands is not yet certain. Selective migrations may have had something to do with the matter. It is also possible that the storm belt at that time was shifted far enough south so that the climate of that region was fairly stimulating as well as drier than now. That, however, is by no means certain and we must leave the matter unsettled. This much, however, is clear. When the white man came to America, something had caused the Maya civilization to fall almost completely into decay. It was scarcely more than a memory, and the Mayas themselves did not know who built the great ruins among which they lived.

The highest American civilizations at that time were located in Peru among the Incas and in Mexico among the Aztecs. In both cases the basis of life was corn grown by means of rain

during a relatively short wet season. This kind of culture spread as far as the climate permitted, reaching its northerly limit just north of the boundary of New Mexico in Colorado. Northward, eastward or westward from there corn culture on any large scale is impossible for people who have neither draft animals nor iron tools. Even in Texas the rains increase so that grassland becomes more and more common, and finally forests prevail. Nevertheless the grasses there are sufficiently bunchy rather than turfy so that corn culture did spread intermittently as far east as Georgia. Northward the summer rains which corn loves give place to winter rains which are of little use to it. Westward the same is true. Where the Colorado River provides natural irrigation, the Mojave Indians formed the last outpost of the corn type of civilization on the west and were immensely superior to their immediate neighbors whom we shall describe in a moment. The similar northern outposts in southern Colorado, the northern parts of Arizona, and New Mexico eked out a precarious existence by means of small streams used for irrigation. Some dwelt in such desert regions that when the time for corn-planting came they placed each seed of corn in a ball of mud, and buried the saturated ball in the sand of a dry flood plain—one of those rivers that flow with the sandy side up, as they say out there. The corn was able to sprout and grow for some time before it again needed to be watered.

Beyond the limits of the corn area the culture of the Indians fell to an extremely low level, especially in California and Utah. In our day California seems to have a very good climate—the people there claim that it is the best in the world. But for primitive Indians the California environment is about as bad as that of the Kalahari Desert. The Californians of to-day, so far as they depend upon local products, owe their prosperity mainly to cattle, wheat, barley, oranges, grapes, vegeta-

bles, gold and petroleum. Every one of the main food products is of European or Asiatic origin, and was not available to the Indians before the days of Columbus. Moreover, all except wheat and cattle depend upon systems of irrigation much more elaborate than was possible for the primitive Indians. The steepness of the California mountains, the early ending of the rainy season, and the general conditions of topography cause the streams to provide almost no natural irrigation fit for corn. Consequently the few Indians who lived in California were doomed to a mode of life almost identical with that of the Bushmen in the Kalahari Desert.

In Utah, Nevada and the other dry regions where winter rains prevail, the condition of civilization was equally low for similar reasons. Farther east in the great plains, agriculture was practically impossible. Not only did the absence of beasts of burden for plowing and of iron tools wherewith to cultivate the land make it impossible to subdue the grasslands, but the presence of great herds of buffalo added another serious difficulty. Not till the buffalo were exterminated could even the white man profitably cultivate most parts of the great plains. On the other hand, the buffaloes provided a means of livelihood more reliable and abundant than that of the hunters elsewhere, and the plains Indians were correspondingly advanced in culture.

The second center of primitive Indian culture lay, as we have said, in the Queen Charlotte Islands, north of Vancouver Island off the coast of British Columbia. There the Haidas, although unable to practice agriculture, built relatively large and permanent villages; engaged actively in commerce, kept slaves, and had a rather highly organized system of government and of social intercourse. How was this possible? Simply because the sea provided two of the great necessities of civilization. One was a permanent supply of food within easy reach



PLATE XXVI. NEW SETTLERS ON THEIR WAY TO OCCUPY THE WEST.

People much like these were the first settlers in a large part of the United States.

and abundant enough so that a considerable number of people could live close together without being obliged to wander about. The other was easy transportation. The Haidas were primarily fishermen. Of course the fish wander around, but nevertheless among the Queen Charlotte Islands they are found in abundance much of the time and every year are so abundant at some seasons that a supply can be laid by for the rest of the year. The cool but not unpleasant summers were a great help, while the mild winters made it possible to engage in fishing of some sort practically all the time. The fact that the Queen Charlotte Islands form an archipelago and that there are many deep bays and narrow inlets along the coast made navigation easy, as did the presence of forests of splendid pines from which boats could be hollowed. Thus among the Haidas, ships took the place of horses and cattle, just as fish took the place of corn, rice or wheat. In addition to all this the climate is very healthful, so that this small area provided the primary requisites of civilization.

Turn now to the northeastern part of the United States where manufacturing is now most abundant and the population most dense. There where the climate is most stimulating ought we not to expect the highest development of Indian civilization? Certainly no such thing occurred there, but the reason is clear enough in the light of the previous discussions of this book. Without iron, beasts of burden or any such special advantages as those enjoyed by the Haidas, the Indians could not to any large degree practice any mode of life except hunting. They did indeed cultivate a little corn in openings in the forest, but to clear large patches and maintain them as permanent fields was out of the question. The speedy growth of grass and the extreme difficulty of spading up enough weedy, grassy land with their crude implements made it impossible.

Nevertheless, and here is the significant fact, so far as

energy, activity and the development of ideas are concerned, the Indians of the north rank extremely high. The Iroquois or Six Nations take the lead. They lived in what is now the state of New York. Only recently has the world realized how far these people had gone in the way of developing governmental institutions. A sort of constitution framed by them and preserved by word of mouth, has recently been published. It is crude and cruel, but it shows the prevalence of high ideals. The constitution outlines an institution suggesting the League of Nations. Its purpose was to create peace and justice among a group of neighboring and often hostile tribes. It provided that if any tribe had a grievance against another there should be meetings for consultation and adjustment. It further provided that if any tribe failed to keep the peace, it should be chastised until it was ready to join with the rest in the great aim of creating a stable political system.

In addition to this germ of modern ideas as to peace and arbitration, the Iroquois had what may almost be regarded as the germ of woman's rights. At any rate, women were respected among them as among very few other primitive people. The main councils were indeed composed of men, but the older women had the privilege of nominating the chiefs.

The more these people are studied the more probable it seems that if they had had an adequate material basis for civilization, they would have progressed rapidly. If beasts of burden and iron tools had enabled them to join their political sagacity with the material prosperity afforded by the corn culture of the Pueblos and with the commercial skill of the Haidas, as might readily have happened, who knows but that Columbus and his followers might have found a highly civilized and populous nation occupying the region where now the United States makes greatest progress. Taken as a whole does it not seem that when allowance is made for their stage of culture, the ad-

justment of the Indians to their climate and to the resources of their land was as close as that of the people in other parts of the world? In the past as in the present, the main colors in the picture of human progress and activity in America seem to have been painted by the geographic environment.

CHAPTER XVI

THE RELATION OF THE SOIL TO ARISTOCRACY AND DEMOCRACY

HAVING surveyed the general principles of human geography, and having looked at certain main portions of the earth in the light of those principles, we may well complete our study by a more detailed examination of certain phenomena in the United States. Let us first consider an example where the soil plays a dominant part. Although the effect of the soil upon the distribution of human progress vies with that of climate and relief, it is much less noticeable. This is partly because the average person is unable to detect the quality of the soil, whereas a child can describe the weather and the hills. Moreover, the effects of the soil are easily and speedily altered by drainage, irrigation, fertilization, plowing, rotation of crops and various other methods, whereas it is much more difficult to change the climate and the relief.

Alabama offers an excellent example of the way in which the soil may enter into the warp and woof of human relationships. From the standpoint of human geography, three main areas may be distinguished. The northern half of the state has poor soil, and is relatively rugged, two conditions which often go together. The central part of this northern half is the southwestern tip of the Appalachian Mountains which enter the state at the northeast corner, and are flanked on the southeast by the comparatively infertile plateau of old contorted rocks known as the Piedmont, and on the northwest by the roughly dissected continuation of the Allegheny plateau of Pennsylvania, Kentucky and Tennessee, consisting of moderately old rocks which still lie nearly horizontal. South of these

three kinds of country, and sweeping around them parallel to the Gulf of Mexico, lies a series of belts of younger rocks forming the Atlantic Coastal Plain. The older belts, which were the first to be exposed as the sea retired, lie at greater altitudes and farther inland than the younger, and have naturally been more fully dissected by streams. In Alabama the differences between one belt and another are peculiarly clear. The belts which rim the southern and western margin of the Piedmont, the Appalachians, and the Plateau consist of sandy rocks containing little lime. They form a somewhat hilly country, not so rough as the plateaus, but with relatively poor soil, good enough for pines, but not especially favorable to broad-leaved trees or crops. This completes the northern area of relatively poor country which becomes excellent only in the far northwest where the Tennessee River has worn out a broad valley and deposited rich alluvium.

The second area centers in the Black Belt, or central prairie region, which extends across the state a little south of the center in the neighborhood of Montgomery and Selma. The Black Belt consists of a sort of rotten limestone known as Selma chalk. The rock is so soft that it has been worn down to a gently undulating topography which permits practically all parts to be cultivated. The soil, a dark gray or almost black clay with some sand, is extremely fertile, and is especially good for cotton. The dark color of this "black waxy" soil, as it is called, has given the region the name of the "Black Belt." There are indeed plenty of black people, but they are not responsible for the name. With the Black Belt should be put what is known as the Post Oak and Blue Marl Regions, as Dr. R. M. Harper has named them, where the soil is also excellent. The three together form a peculiarly fertile strip thirty or forty miles wide extending roughly from southeast to northwest across the state a little south of the center.

Farther south in a transitional area of reddish sandy loam, known as the Red Hills, the soil is moderately rich but the hills sometimes rise two hundred feet. Then come the infertile Lime Hills and Lime Sinks, and the poor sandy soil of the Southern Pine Belt, making the third of the main areas from the human standpoint. Thus in a broad way Alabama has three main parts; first, an area of poor soils and unfavorable topography in all the northern half aside from the Tennessee Valley; second, the rich, black, waxy soil of the Black Belt, together with the good soil of its immediate borders; and third, a southern belt of poor soils.

In practically every phase of human activity the results of this situation are so apparent that the student of the geography of Alabama is likely to forget the dominant tints which determine the main outlines of the great picture of human geography, and to be lost in enthusiasm over the beautiful contrasts and shadings afforded by the soil and relief in a single small part of the canvas.

Let us consider the nature of some of these contrasts, and then explain them. One of the most noteworthy features of the Black Belt is the small proportion of white inhabitants, nowhere much over thirty per cent. The two areas where the soil is poor, on the other hand, have a very large percentage of white inhabitants, rising to over ninety in the rugged and infertile northern counties, and to seventy or eighty in the infertile southern counties. Of course the reverse is true of the Negroes; in some counties of the Black Belt they comprise almost ninety per cent of the population, whereas in some of the northern counties they number less than one per cent. The white people seem almost to shun the good land, whereas the colored people seek it. This is true not only of Alabama but all over the South, as has been well shown by Dr. Harper. Moreover, the same principle applies in other parts of the world, such as

China, England, and Italy. Wherever the soil is highly fertile, the higher elements of the population are apt to form only a small minority, while the lower elements form a huge majority.

Among the farmers this is even more notably the case than among the rest of the population. In the Black Belt there is less than one white farmer per square mile; on the infertile sands of the south there are five or even seven on an average, and in the lands of the north where ruggedness is added to infertility, the number runs still higher, being five to nine in a large group of counties. The number of colored farmers varies in the inverse way, being four to seven per square mile in the counties of the Black Belt where the soil is richest, and dropping to little more than one in the sands of the south. Curious as it may seem, the tendency of the white farmers to keep away from the good soil and settle on the poor soil is even greater than that of the white people engaged in other occupations. The Negro farmer, on the contrary, seems to be drawn toward the good soil almost as by a magnet, and avoids the poorer, less fertile soils.

The products of the soil, as well as the people who till it, vary greatly from the Black Belt to the other parts of the country. Since the soil of the Black Belt is admirable for cotton, it is not surprising that about 1910, when the cotton-raising industry of Alabama was most prosperous, half or two-thirds of all the cultivated land was devoted to this crop. As one goes away from the fertile soil of the Black Belt, the tendency to utilize the land for cotton declines rapidly. In a large part of northern Alabama, and likewise on the sandy soil of the south, the area in cotton is less than ten per cent of the total area cultivated by the white people. The Negroes, however, everywhere have had the habit of raising an unduly large proportion of cotton. In 1910, in practically every county in the state, more than half of the land cultivated by Negroes was

given to cotton. In the Black Belt many of the colored farmers actually used to put more than four-fifths of their land into cotton, planting practically nothing else except a patch of corn too small to supply the needs of even their own families.

This represents the extreme of what is known as one-crop farming. It needs no argument to show how dangerous it is. If many of the people depend on a single crop, any variation in the size and price of that crop is bound to be important. If the crop is unstable, like cotton, the situation is far worse. Cotton is unstable partly because the boll weevil lays its eggs in the green cotton balls and ruins them. It is also unstable because the United States still raises more than half of the world's total cotton crop and formerly raised an even larger percentage. Thus the price depends largely upon the American crop, for a poor crop here is not likely to be fully balanced by a good crop elsewhere. Moreover, cotton is an export crop, and therefore is much more subject to interruptions by such events as the Civil War or the World War than is a crop like corn which is grown mainly for home consumption. All these things combine to cause the one-crop system of farming to be very precarious in Alabama, especially among the colored people, and most of all among the colored people of the Black Belt.

Since the soil of the Black Belt is so well adapted to cotton, one would naturally expect the yield per acre to be large, but this is by no means the case. On a map showing the yield of cotton per acre on the farms of white men, the Black Belt forms a continuous strip where the average yield in 1909 was less than a third of a bale per acre, and in some counties less than a fourth. Yields of more than four-tenths of a bale per acre as the average for a whole county were obtained only in countries where the soil is relatively poor. Among the Negroes a similar but even more extreme condition prevails. In the Black Belt the average yield on the colored farms is systemati-

cally less than on the white man's farms, but it shows the same tendency to be low where the soil is good. In 1909, before the boll weevil had begun to do serious damage, it averaged less than a fourth of a bale in the Black Belt, and in some counties less than a fifth. Away from the Black Belt, the yield increases quite regularly except in the Tennessee Valley where it is also low. One of the most curious features of the whole situation is that the more the soil and the social conditions depart from the type found in the Black Belt, the greater the yield and the more nearly the colored farms rival the white farms. Where the soil is poor, Negroes and whites both get about the same return and both get much more than in the fertile Black Belt.

The good yield in the poorer regions is of course due partly to the fact that only the best land is there put into cotton. But that does not explain the very low average yield of the best land, nor the tendency for the Negroes to rival the whites on the poor land. Nor does it explain the equally curious fact that where the soil is most fertile the value of the farm land per acre is less than in almost any other part of the state. Of course the value of the land depends directly upon its productivity. People cannot afford high prices for land that brings a small return. But why is the return so small in the Black Belt? It was not so a century ago, for then the land there was highly valued, while land in the sandy regions and the hills could be had almost for the taking. It begins to look as though good soil were a distinct disadvantage.

Looking at the matter more closely we discover that the disadvantages of the good soil fall mainly on the Negro, not the white man. The size of farms illustrates this. On the good soil of the Black Belt the white farms are large, averaging nearly two hundred acres. The colored farms, on the contrary, are small, averaging less than a fourth as large as those of the

white men. But where the soil and relief are poor, the farms of the two groups do not differ greatly in size, the average for the whites being seventy-five to eighty acres and for the colored people fifty-five. This illustrates two important geographic principles. One of these is that as a rule, the better the land, the larger the holdings of the rich and the smaller the holdings of the poor. The second is that, under adverse conditions, social contrasts of all kinds are reduced to a minimum, whereas under favorable conditions they are accentuated.

This last principle is illustrated by the ownership of homes and farms. In the Black Belt practically all of the white farmers own their farms; on the poorer soils this is not so fully the case. The great contrast, however, occurs among the Negroes. Among them the degree of tenancy in the Black Belt is astounding. Scarcely five per cent own their homes free of mortgage, and less than half own their farms even under heavy mortgages. Around Birmingham, on the contrary, more than half of the colored people own their farms without mortgages, while in Mobile county the percentage actually rises above eighty. Here again as one goes away from the Black Belt, the condition of the colored people approximates toward that of the whites.

Information as to the rates of interest paid by the colored people as compared with the whites are not available, but they are high. When both races are taken together, a clear contrast is apparent between good soil and poor. All rates of interest are higher in the South than in the North, so that the majority of farm mortgages in Alabama bear seven per cent or more. In the Black Belt, however, and there only, save for three counties near Mobile, the rate of interest in 1920 averaged less than six per cent. Elsewhere it rises higher, and in the less favored counties actually reaches eight per cent. If the value of land

per acre in the Black Belt were higher than elsewhere, this would not be surprising. The most valuable land would be expected to carry the lowest rate of interest. But the land in the Black Belt, as we have seen, is less valuable than the other farm land. The point seems to be that even though it yields less per acre, the land in the Black Belt is more profitable and hence more easily salable than the land elsewhere. It is profitable because crops can be raised upon it with the minimum degree of labor and intelligence.

Before we explain these seeming inconsistencies, let us look at the contrast between the whites and the colored people in still another way. Houses and barns furnished one of the best measures of prosperity. In this respect, as in almost every other, the Black Belt stands out conspicuously. According to the Census, the average value of the farm buildings of the white men in the Black Belt nowhere fell below \$674 in 1910, while in one county it rose above \$1,000. These values do indeed sound very small, but compared with those for other parts of the South at that time, they are large. As one goes away from the Black Belt, the values decline almost to \$300 in the sand hills and lime sink country of the south, and to \$250 or less in the poor counties of the north. The magnitude of this difference becomes apparent when one considers that the average white farmer's house and barn are worth three or four times as much in the Black Belt as in almost any other part of the state.

For the colored people the reverse is true. Not only does the value of the buildings fall to the almost incredibly low limits of \$94 in the poorest counties and \$297 in the best, near Birmingham, but where the white people's farm buildings are most valuable, those of the colored people are poorest. In no less than five counties of the Black Belt — and there alone — the value of the buildings on colored farms falls below a hun-

dred dollars. In the Black Belt the white man's farm buildings average five to eight times as valuable as those of the colored people around him; in most of the state the corresponding figure is only two or three, while in the sandy southern counties the figure falls below two. Is it not extraordinary that the fertility of the soil should lead to such high prosperity among the white people and such poverty among the colored, whereas the poor soils bring equality?

This tendency toward a high-grade aristocracy and a low-grade peasantry on the good soil is especially clear in respect to illiteracy. Ordinarily illiteracy is higher in rural regions than in cities, but in Alabama the rural Black Belt shows the lowest illiteracy among the native whites, even less than in the cities of Birmingham and Mobile. That gives a measure of the degree to which the white people of the Black Belt surpass the other inhabitants of Alabama. In some of the rugged, infertile counties of the north and the sandy counties of the south the white illiteracy is from six to eleven times as great as in the Black Belt. Among the colored people, on the contrary, the illiteracy in the Black Belt in 1920 was far greater than in any other part of the state and from twenty to thirty times as great as among the white people. In many counties more than forty per cent of the colored adults cannot read or write. Nowhere else in Alabama are conditions so bad. Moreover, the very regions where infertile soil and unfavorable relief are commonly given as excuses for illiteracy among the white people, are the parts where the colored people are best educated. In education, as in the value of buildings, the regions where the soil is best are characterized by a scanty white aristocracy which stands very high and by dense masses of colored people whose level is extremely low. Where the soil is poor and the conditions of life are hard, not only are the colored people relatively few compared with the whites, but the whites are depressingly

ignorant, being almost rivalled in some counties by the colored people, who there do better than anywhere else.

The difference between the Black Belt and the poorer parts of Alabama is reflected in politics as clearly as in economic conditions and education. For example, in 1848 the Democratic Party had begun the process whereby it finally gained control of the South and ultimately carried it out of the Union. That sweep of a political idea represents a stroke of the artist's brush dipped in the colors of climate. In the ultimate analysis, as we have seen elsewhere, slavery persisted in the South and not in the North for economic reasons. As long as the institution of slavery remained unassailed, the people of the southern states divided themselves between the two great political parties in the normal fashion. The prosperous people, unless they had some special interest, tended to be conservative and to adhere to the Whig Party. The less prosperous people, unless they also had some special interest, tended to be progressive and favored the Democratic Party with its promises of a new order and of a millenium for the poor and oppressed. Inevitably, then, the white people of the Black Belt were predominantly Whigs.

The presidential election of 1848 occurred when the South was already beginning to be strongly swept by the conflict over slavery. Nevertheless the aristocratic Black Belt still cast about ten votes for Taylor, the Whig candidate, for every six or eight cast for Cass, the Democratic candidate. In northern Alabama on the contrary, among the poor white people of the mountains, many counties cast three votes for Cass compared with one for his Whig opponent. Still more significant is the fact that even in southern Alabama where the sandy soil prevails, the vote for the Democratic candidate likewise exceeded that for the Whig in at least four counties. The Black Belt was the last stronghold of the conservative Whigs. Only when

they saw that their economic situation was threatened, did they swing over to the Democratic Party. The character of the soil was the foundation of the train of causes which made that particular region politically conservative, whereas the poverty of the soil elsewhere made the people more radical.

Let us try to bring more order out of the mass of facts presented in this chapter. Our main conclusion thus far is that, in Alabama at least, the best soil has tended to concentrate on itself a small, but rich, well educated, powerful and conservative white aristocracy who lord it over a highly numerous, poor, ignorant and incompetent colored peasantry. The poorer soils, on the other hand, have tended toward the concentration of a people among whom there are no such extremes as on the rich soil; the white and the black, the rich and the poor, the well educated and the ignorant, the highest and the lowest tend to differ far less than in the Black Belt. Indeed, the poorer the soil and the rougher the relief the more fully the contrasts disappear. The social conditions are closely analogous to those which cause the people of deserts to be highly democratic. Just as no one in the desert can have a very large tent or carry with him a great amount of breakable, heavy furniture, so the people on the poorer soils cannot accumulate the capital wherewith to build fine houses, add lands to lands to form great estates, and educate their children at the best schools wherever they may be.

Although this sociologic contrast owes its origin in part to the direct effect of wealth on the one hand and poverty on the other, it may owe still more to the process of social selection which we have so often seen exemplified. Let us trace the historic process by which the Black Belt has become so different economically and sociologically from the rest of Alabama. Most of the first settlers approached Alabama from the states farther north. Some traveled along the Piedmont Plateau at

the base of the mountains; some came down the great Appalachian Valley just west of the Blue Ridge; a few came from the coast. The settlers of a new country of course comprise many different types. Some are earnest seekers for new homes; others are adventurers who want to get away from the restraints of older societies; some have failed at home and fare forth with the hope of retrieving their fortunes; others have succeeded but are so full of the spirit of adventure, the love of novelty, or the desire to get ahead rapidly, that they cannot be happy at home when new regions beckon them onward.

When people of various types like these leave their old homes, the accuracy and extent of their knowledge of the new land are highly diverse. Some have merely heard that Alabama, for example, offers a good chance to the settler. They load up their household goods and venture forth without any definite plan. They tell themselves that they will keep an open mind, look over the land as they go along, pick up information here and there, and settle in some place that strikes their fancy. Others, of a more thoughtful type, investigate the possibilities of the new region, read about it in books or papers, or as was much more often the case in the history of Alabama, get information by letter from persons who have already gone to the new country. In that way they find out where the best land is located, and where they had better settle. Thus at the very start there arises a process of selection. Some of the ignorant and happy-go-lucky people may settle on some of the best land, but many settle elsewhere. Among those who are especially thoughtful and competent, on the other hand, a much larger proportion are likely to go directly to the best region.

Many factors beside the quality of the soil doubtless enter into the choice of homes. Our point is merely that when a new country is settled, other things being equal, a higher percentage

of the more intelligent people go to the good lands than to the poor. That appears to have been what happened in Alabama. It is certainly what happens today, provided there are no disturbing factors such as the race question. If we divide the counties of almost any large state on the basis of the value of the land, the United States census shows that the foreign-born farmers who settle on the good land are better educated — more literate — than those who settle on the poor. In other words, among modern settlers those who have intelligence use it, and those who have not, trust to luck. In early Alabama there is plenty of evidence that the same was true.

In later generations this initial advantage of the Black Belt was intensified, as is usually the case, but was also mingled with disadvantages, as is also usually the case. Suppose that two men, one intelligent and industrious, the other unintelligent and shiftless, happen to settle near together on poor soil. Which is more likely to move away? Many factors of course enter into the matter, but the course of history and the census data of the United States seem to show that the intelligent man is the more likely to go. Not only does his intelligence prompt him to this, but his hard work enables him to acquire sufficient capital to buy land where the soil is better. If two similar men settle on good soil like that of the Black Belt, the unintelligent and thriftless one is likely to fall into debt, and perhaps mortgage his farm. In a year of misfortune his mortgage is likely to be foreclosed, and he may move away to a district where the soil is poorer and land can still be had almost for the taking.

Exactly this sort of thing happened in Alabama again and again during the early days. In that way, as well as because wealth provided opportunities, the Black Belt became the home of an aristocracy which furnished a surprisingly large proportion of leaders. When such an aristocracy becomes established,

the children tend to intermarry with their own kind and the original qualities are preserved. Thus even today the percentage of young people who go to college is peculiarly high among the white people of the Black Belt, as is the number of adults included in *Who's Who*.

Now for the disadvantages of a fertile soil. Why has the Black Belt developed an ignorant Negro peasantry as well as an intelligent white aristocracy? The causes which lead to one have also led to the other. When intelligent men acquire large holdings and are able to raise profitable crops, they naturally need laborers. They do not wish to sell their land to independent farmers; they want workers who are willing to become tenants. In the early days of Alabama the natural way to supply this need was to purchase slaves. The rich planters wanted a certain number of the more delicate and intelligent type, the so-called "Guinea Niggers," to act as house servants, but the great need was for large numbers of field hands, the brawny and rather stupid type often designated as "Congo Niggers." That gave a low stamp to the colored population as a whole.

The sale of slaves from one state to another did not help matters. In Kentucky, for example, the climate is so cool that cotton cannot be raised in appreciable quantities. So the Kentucky slave owners sold their surplus slaves farther south, and some of them even raised slaves as they raised horses. Before the Civil War the shipment of slaves from Kentucky and other relatively northern slave regions to the cotton country became a regular business. The first to be thus sold were naturally those who had strong physiques but were lacking in intelligence or were surly in disposition. Such Negroes were good enough to pick cotton in the hot sun. The Black Belt, by reason of its good soil, absorbed a high proportion of them.

Before the Civil War another factor may have slightly lowered the caliber of the Negroes in the Black Belt; since then it has quite certainly done so to a high degree. In the days of slavery a few slaves in every generation were set free. Sometimes the freedmen were given a bit of land and allowed to settle near the old home. If they had ambition, however, they were likely to wish to strike out for themselves. In that case the natural thing was to go off to the sparsely settled regions of infertile soil where plenty of land was available at an extremely low price. Thus the infertile parts of Alabama received a few Negroes who were unusually intelligent and competent, and of excellent disposition, as evinced by the fact that their masters set them free.

Since the Civil War, a similar selective process has acted more fully. As soon as the slaves were set free, most of them rented the land on which they were already at work. Before long, however, a considerable number of the more independent and ambitious wanted to do things on a larger scale than before, and to feel that they were really free, like the white men. In the parts of Alabama where the soil and topography are less favorable, large tracts of land were still almost unoccupied. So the first great movement of the Negroes after the War in Alabama was an outward migration of the more independent and ambitious types from the congested Black Belt into the regions of poorer soil. Their new neighbors were mainly white men who had been less successful than the aristocracy of the Black Belt. Thus on the poor soil the two races approached one another, not only geographically, but socially and even in their biological inheritance of intelligence and temperament. But in the Black Belt the contrast became greater than ever, because the abler, thriftier Negroes were more likely than the stupid, thriftless ones, to move away.

A later series of events has still further lowered the quality

of the Negroes in the Black Belt. This began with the demand for colored people as servants in the North, and with the opportunities for education offered by northerners who established schools in the South. Both factors tended to draw off the more ambitious young people and to prevent them from returning to the Black Belt. If a boy educated in a school like Hampton or Tuskegee wants to buy a farm of his own rather than become the tenant of some large white owner in the Black Belt, he naturally settles in one of the counties where the soil is poorer and the Negroes less numerous.

Then came the boll weevil, which reached the southwestern corner of Alabama in 1907, and during the next eight years spread completely over the state. That dealt a terrible blow to the cotton industry. The more fully people depended upon cotton, the more they suffered. The region of greatest suffering was naturally the Black Belt, and the people who suffered most were the colored people. On the heels of this disaster the World War sent the price of cotton toppling downward so fast that everyone was urged to "buy a bale" in order to save the cotton states from ruin. Before the cotton farmers recovered from this blow, the war industries in the North created a tremendous demand for labor, which could no longer be supplied by immigrants from Europe. Finally, in 1926 a phenomenally abundant crop, the greatest in history, caused the price of cotton to drop so low that all the profit on a whole year's work was destroyed.

These conditions subjected the colored people of the cotton belt to a tremendous outward push because their one great crop failed them, and to a tremendous pull because of the high wages offered not only in their own city of Birmingham, but far north in Chicago and elsewhere. The inevitable result was a tremendous abandonment of cotton raising and a migration away from the Black Belt. In many counties the area devoted

to cotton was only half as great in 1919 as in 1909, while the population fell off twenty per cent. Nevertheless in the poor soils of the north and south of Alabama both the area devoted to cotton and the population actually increased. In the southern tier of counties the increase in population ranged from twelve to twenty-four per cent, and around Birmingham it reached thirty-seven per cent. In this crisis, as in almost every other, the Black Belt acted differently from the rest of the state. Moreover, this last migration, like practically every other, was selective. The most conservative and shiftless Negroes were the ones most likely to stay at home; the more energetic and ambitious moved out. Thus a long series of events has tended more or less steadily to concentrate a very poor type of Negro on the rich land of the Black Belt. Now we see why it is that, although the soil of the Black Belt is unusually good for cotton, the yield per acre is smaller than anywhere else in the state. As the quality of the Negroes has declined, not only has the soil been depleted by the constant cultivation of a single crop without proper fertilization and rotation, but the methods of cultivation have grown more lax, and the ravages of the boll weevil have not been intelligently checked by burning the cotton stalks and otherwise. The white man himself has been unwise in his methods, and the Negro still more so. Even on the white farms the Negroes do all the work and the owners cannot make them work intelligently. So the white planters have yielded to the temptation to get the best possible returns, regardless of what happens to the land or of how much the boll weevil increases.

Here then is what has happened: the soil of the Black Belt was originally very fertile. It attracted settlers of a high type. Their success and the nature of their crops attracted people of a poorer type. The inefficiency of the poor type, together with

the desire of the higher type for immediate gain, permitted the soil to deteriorate. Other factors like the boll weevil, the World War, the bumper crop of 1926, have taken a hand. The geographic factors have remained almost unchanged, for even the depletion of the soil is only temporary, but a human cycle has taken place.

Such a cycle is typical of what is happening all over the world. One sees it in England, for example, where the fertile eastern counties have been surprisingly productive, both agriculturally and as a source of leaders. But today the peasantry there has fallen to a low ebb and it is doubtful whether the upper classes are holding their own in the face of the attractive power of the city. One sees an extremely old phase of the cycle in China, where the best soil in the Great Plains is peopled by a highly intelligent and competent aristocracy which appears to be declining, and by a vast body of industrious but dull and unprogressive peasants.

Even in a new state like Iowa the same thing is evident. In the six almost purely rural counties with the least valuable farm land, only thirty-eight per cent of the native white farmers and fourteen per cent of the foreign-born are tenants. In the six similar counties with the most expensive land, the corresponding numbers are sixty and fifty, even though the first settlers arrived only about 1860. Of course all parts of Iowa rank high agriculturally, but even so, there is a great difference between one part and another as to the rapidity with which a tenant class is developing. Sometimes indeed, tenancy is a step toward ownership, but as a rule it is a sign of the development of a group of people who, through lack of ability or opportunity, are forced to remain at a relatively low social level in comparison with that of the owners of the soil. How far this tendency will go in a state like Iowa, no one can say. The sig-

nificant thing is that wherever good soil and poor lie near together, and other conditions are similar, the good soil tends toward the development of class distinctions and an aristocratic form of social organization, whereas the poor soil tends toward uniformity and democracy.

CHAPTER XVII

AN EXAMPLE OF TRANSPORTATION

IN our study of the decrees whereby the earth allots certain occupations, modes of life, degrees of health, and stages of progress to certain definite regions, we have passed from the bolder to the more delicate tints of the terrestrial canvas. In this last chapter let us confine ourselves to a small section of the earth's surface where two contrasted tints stand side by side. They illustrate the local contrasts which we encounter almost every day, even though we often fail to think of them.

Albemarle and Buckingham counties in central Virginia afford an impressive contrast. Albemarle is a beautiful, hilly district in the Piedmont region at the eastern base of the Blue Ridge. Riding over its finely paved main roads, one is charmed by fertile fields of corn, wheat and hay, broad, well-kept apple orchards, wooded hills, and picturesque pastures studded with dark cedars or pretty scrub pines. In spring the pastures are gorgeous with orange-yellow masses of Scotch broom, introduced by Thomas Jefferson to check the growth of gullies in his fields; the meadows are yellow with European buttercups, or white with daisies which likewise came to Virginia from Europe, but by way of the hay which the northern soldiers brought with them for their horses during the Civil War.

Even more charming than the fields are the many attractive farm houses nestling among the trees, and the large plantation homes, which might almost be called manor houses. Walls of red brick, set off by tall white pillars two stories high, gleam for a moment on some fair hilltop and then are hidden

among the trees. Supreme among such houses stands Monticello, the home of Thomas Jefferson, on its acres of tree-girt lawn where many feet of the hilltop were cut off in order to provide level land for a human habitation. The house itself is a superb example of the way in which a truly great mind interests itself in every phase of life, and evolves original ideas along a score of lines. Witness, for example, the clever way in which the slave quarters that flank the house on either side are hidden beneath the brow of the hill, so that from the house itself one scarcely sees more than their roofs. From Monticello one can look eastward and downward upon the well-tilled Piedmont lowland, or southwestward to the prosperous little city of Charlottesville and to its hilltop where Jefferson, through a telescope, watched day by day the rising walls of the University of Virginia, another beautiful and influential product of his fertile imagination.

Throughout almost its entire history, Albemarle County has been noteworthy for its prosperity, education, churches and organizations devoted to culture and progress as well as to material prosperity. It has been still more noteworthy for its large proportion of highminded leaders like the early families of Lewis and Clark who led the famous expedition that explored the Columbia River and saved that region to the United States; or like Monroe who moved to the county to be near Jefferson; or the Langhorne family which came in later times and gave to the world that fine exponent of America and of feminism, Lady Astor.

Southeast of Albemarle County lies Buckingham. The muddy flood of the Potomac rolls between the two, but there is a greater separation. Buckingham County has the reputation of being one of the most backward counties of Virginia, while Albemarle is highly progressive. Buckingham not only has scarcely three-quarters as many people now as in 1810, while

Albemarle has twice as many, but Buckingham has lost its leaders in far greater proportion than its common people. For mile after mile one rides through a scrubby, half-grown forest of hardwood trees with large patches of abandoned fields grown up to the useless scrub pine which is too small and light for either timber or fire wood. On the roads, muddy, horse-drawn vehicles have not yet been replaced by automobiles. Not a mile of road in the county is paved; practically none of the roads are even dragged or scraped to get rid of the ruts cut deep in the sticky spring mud. Here and there a little shack stands in a clearing, but one cannot tell whether it belongs to white people or colored. Once in a while a more pretentious house is surrounded by broader, more fertile fields, but most of the houses of this sort are old, some are unoccupied, and practically all are decaying. In such a county it is not strange that the hunting and fishing are good. The schools are likewise poor and widely scattered. In one district — perhaps eight by fifteen miles in extent — there is only one school for the white children, and that has only one room. Many of the children cannot possibly get to school much of the year.

The people complain that such conditions are the result of neglect and unfairness on the part of the state government. More to the point is the assertion that the local government is corrupt and wasteful, but even this is mainly a result rather than a cause of the inefficiency of the people. Nevertheless the value of the taxable property is so low, and the population so sparse, that even the most honest officials, unless extraordinary wise, energetic and persuasive, could not build cement roads and maintain good schools, as is done in Albemarle County.

Why should there be such a difference between regions so close together and so similar in many respects? The obvious answer is that the people are different, but why should the

people thus differ? Is it sheer accident? This is a geographical problem, and we must inquire whether either county has any appreciable advantage. So far as general location is concerned there seems little to choose; both counties lie on the James River in the Piedmont Plateau with their centers about sixty miles from Richmond in a more or less westerly direction. In climate they are almost identical. Albemarle does indeed lie a little higher than its neighbor and is consequently a trifle more healthful and stimulating, but even an ardent advocate of climatic influences could scarcely find in this any appreciable cause of the general disparity.

When it comes to the relief of the land the main advantages are with Buckingham. That county is distinctly the more level of the two, easier to cultivate and easier to traverse. Parts of Albemarle are so rough that when you ask the intelligent people of Charlottesville where the nearest Mountain Whites are found, they answer: "Only four or five miles away, over there in the Ragged Mountains. That is the place for moonshine whiskey. They put it in quart fruit jars and bring it to the city."

Perhaps the soil of the two counties is different. The professor of botany at the University of Virginia says that judging by the wild vegetation the soil of the poorer county is better than that of the other; the professor of geology says that judging by the rock formations it may be the other way around. Judging by the United States census one would say that there is little to choose. In 1919 the average value of the crops per acre amounted to more than \$65 in Albemarle and less than \$70 in Buckingham. So from the standpoint of the soil, as from that of relief, the advantage, if there is any, lies with the poorer county. The same is true of the mineral resources, for Buckingham produces good slate and once had some insignificant mines of gold and iron, while Albemarle has no minerals

worth exploiting. But none of these differences is enough to account for the social and economic contrast.

Where then shall we turn for an explanation? The only remaining feature of the geographic environment is the routes of travel which traverse the two counties. Do they show any differences capable of explaining the profound differences in the people? Yes, in two respects, although neither works in quite the way that one would expect. In pioneer times when the character of a population is being determined, rivers, river valleys and mountain passes are extremely important because they guide the routes of migration. Later they are equally important because they determine where canals, railways, motor highways and centers of communication shall be located. In Virginia the James River has always been the most important waterway and its valley was for a long time the most vital line of movement from east to west. This condition gave Buckingham County an advantage at the start, and would lead us to expect a condition the opposite of that which actually prevails.

The James River forms the northwestern and northern boundary of Buckingham County for forty miles — much more if all the windings are taken into account. In the middle of that stretch the southern end of Albemarle County is bordered by the river for a dozen miles or more. No part of Buckingham is more than twenty-five miles from the river, while three-fifths is within ten miles. Part of Albemarle, on the contrary, lies more than thirty miles from the river, while only about a quarter lies within ten miles. This fraction does not rise to a half even if we include the short navigable portion of the little Rivanna River which flows south through Albemarle.

In our day of railroads and automobiles, such conditions make practically no difference; in early days they made all the difference in the world. On the ordinary dirt roads of Virginia, with horses or mules to do the pulling, a haul of a hun-

dred miles eats up all the profit on wheat or corn and makes the ultimate sale an actual loss. So a haul of even sixty miles from the center of either Buckingham or Albemarle counties to tide-water at Richmond was a very serious matter. Of course it was not so bad in the case of tobacco, for that product is light compared with its value, a fact which helps Buckingham where much tobacco is grown, but not Albemarle. Nevertheless even for tobacco growers the cost of transportation over dirt roads is so serious that as soon as the settlements of Virginia spread beyond tide-water, that is, west of Richmond, there began to be agitation for the improvement of the waterways. Washington was the most earnest and influential advocate of this policy. He wished not only to benefit Virginia but to connect the Atlantic Coast with the Great Lakes, the Ohio, the Mississippi, the Far West, and even the Pacific, by a series of waterways supplemented by short links of good road. No one then dreamed of railways or automobiles, and it looked as if waterways would always be the best means of communication.

The first step was to overcome the falls and rapid along the "fall line" where the old Piedmont rocks meet the new rocks of the Atlantic Coastal Plain. That meant canals and locks around the falls above Richmond on the James River, above Washington on the Potomac, and at corresponding points elsewhere. The second step was to straighten and deepen the channel above the fall line until the base of the Appalachians was reached. Then came the third step in the form of more canals around the rapids where the streams traverse the Blue Ridge.

The Revolution checked the plans for such development, but when peace was assured Washington began agitating again. The whole matter is fully described by Professor W. F. Dunaway in a useful member of that great series of documents known as doctors' theses, published in this case by Columbia University. To cut a long story short, the James River Com-

pany, which later became the James River and Kanawha Company, was organized by private subscription, but with state aid, to improve the James River. By 1795 a canal around the falls above Richmond had been completed, so that boats from upriver could load and unload at the city; the river as far upstream as Lynchburg near the foot of the Blue Ridge was soon cleared of obstructions, and the future looked bright. Indeed it was bright. For sixty years thereafter the James River Company, or its successor, was the largest and most influential corporation in the state; for decades it yielded its stockholders twelve per cent or more each year. The state took it over, to be sure, in 1820 because it had difficulty in financing its more ambitious projects, but that is beyond our problem.

Suppose you had lived in Albemarle or Buckingham counties in 1795, how would you have felt? If you were an ordinary intelligent farmer living within ten miles of the river, you would have been overjoyed. No more long drives to Richmond; just a short haul — five miles or less for about a third of the Buckingham people — put your produce on a regular boat, and there you are as good as at the market. Thus spoke many of the Buckingham people and some of those in Albemarle, but only a few, for nearly nine-tenths of Albemarle still had a haul of five to thirty miles to navigation.

No wonder the balance swung in favor of Buckingham. In 1790 that county contained nearly ten thousand people compared with twelve and a half in Albemarle; in 1800 Buckingham had increased about thirty-seven per cent and Albemarle thirty-two per cent. In 1810 Buckingham had forged ahead to a total of over twenty thousand inhabitants, an increase of about fifty-four per cent, against only eighteen thousand for Albemarle. Is it any wonder that many serious geographers, seeing bright spots of color like this dotted all over the canvas of geography, have supposed that mere location in respect to

transportation facilities is the central theme of their whole science? They forget that exactly the same conditions of rivers, rapids, soil and the like would by no means produce such results in the half of the earth's land that are too cold, too dry, or too warm and wet for agriculture, nor yet in the tropical regions of hoe culture where technical skill has never yet developed, nor even in the rice lands where the level of productivity is so low that people can maintain their standards of living without being obliged to dispose of surplus products to any large degree. Only where the farmers are so skilled and energetic that they raise and sell abundant produce do facilities for long distance transportation assume such importance as in Virginia. Yet even in the most backward environments transportation is often the dominant factor in producing local differences of extraordinary intensity.

The next step in the history of our two counties emphasizes still further the overwhelming local importance of transportation, especially in the higher stages of civilization. As long as the James River Company paid good dividends, its stockholders did not care to spend their money on either upkeep or improvements. So there was constant complaint that the river was not kept properly open. Boats sometimes stranded on sandbars within a few hundred yards of the mouth of the canal, and there were bad places all along the river. The final result was that when the state took over the James River Company in 1820, the plan was to build a canal parallel to the river, and close beside it, all the way to Lynchburg and beyond. Which side of the river should it go on? Should Albemarle and its neighbors get it on the north, or Buckingham on the south?

The decision went to the north mainly because the first settlers in Virginia wanted to locate on an island for the sake of safety, and found such an island on the north side of the James River. Therefore settlement naturally proceeded fastest on

that side, and Richmond happened to be located there when a town was founded at the head of tide-water navigation below the falls. From that time on, the north side of the river was preferred to the south more than ever. Not only was it an advantage commercially to be on the side of the river where the ships from England, New England and Holland came to port, but it was still more of an advantage socially and politically. What a nuisance to be marooned by floods on the south side of the river just when the great social or political events of the year were taking place! So the more influential aristocrats tended to be concentrated on the north side of the James River.

When the canal was built around the falls, the north side again was the natural place for it. Only if there had been some strong geographical reason would it have been located on the south. As soon as the longer canal was planned to run parallel to the river for many scores of miles, the north side was still the place, for otherwise the canal would have had to cross the river, thus exposing it to danger from floods. In later times, when a railroad supplanted the canal, by far the cheapest and easiest place to build it was along the old tow-path of the canal, but that falls later than our story.

The final decision to build a canal along the James River on the *north* side was the death knell of Buckingham County's prosperity. Ridiculous, do you say? Well, perhaps, but it is true. Between 1810 and 1820 the population of Buckingham fell off about twelve per cent, while that of Albemarle increased about eight per cent. The only assignable causes for such a contrast appear to be the poor way in which the river navigation was maintained, the prospect that a canal on the north would soon make matters worse, and the over-development of the previous decade which may have led to the use of poor land.

But why should it make such a difference whether the canal

was on one side or the other? The river is only a few hundred feet wide. Could not bridges or at least ferries be installed? Yes, but not easily. The James River is subject to severe floods which make it difficult to build bridges that will stand permanently. A flood in 1771, which carried off a mill belonging to Thomas Jefferson, was so severe that it led to special action by the provincial legislature. Not till 1855 were the "South Side Connections" finally built by the state-controlled canal company in the form of three bridges, scores of miles apart. There are more bridges now, but they still have an unpleasant habit of being carried out by the floods. Those same floods make it hard to maintain ferries, and there never has been traffic enough to maintain more than a few. Thus the fact that the canal was on the other side of the river subjected most of the Buckingham farmers to the extra cost and delay not only of ferriage but of a considerably longer haul than was necessary when the river boats would stop anywhere. Why should people put up with such difficulties when there was plenty of better land to be had for the taking farther west? So people began to move away; by 1870 the population of Buckingham County had declined to thirteen thousand, less than half of what Albemarle had at the same time.

Was this necessary? Might not the twenty thousand Buckingham people of 1810 have gotten the canal located on their side of the river? Or failing in that might they not have built and maintained ferries and bridges so that they would suffer no serious handicap? These questions bring up the most subtle of geographical problems — the human element. If families like those of Jefferson, Monroe, Lewis, Clark and Lady Astor had dwelt in Buckingham instead of Albemarle, would they not have overcome the relatively slight handicap of having the canal beyond the river? Very likely, but they lived north of the river instead of south of it, and the main question that con-

fronts us is why the people to the north had so much more ability than those to the south.

We have already traced the sequence of events which made the north side of the James River more aristocratic than the south side, and put the canal on that side of the river. The inevitable continuation of that sequence was that when the zone of settlement moved west the settlers in the Piedmont counties north of the river tended to surpass those on the south side in their percentage of men of fine ancestry and innate intelligence. Jefferson, Monroe, Madison, Randolph and others exemplify the matter. Albemarle county got its full share of such people, helped perhaps by its natural beauty and by the fact that it is traversed by a main line of communication leading from Richmond to the Great Appalachian or Shenandoah Valley by way of a low gap in the Blue Ridge west of Charlottesville. That gap helped not only to bring able aristocrats, but to provide the element most lacking in old Virginia. The great social defect of colonial Virginia, as has often been pointed out, was its almost complete lack of a middle class. It had its rich and aristocratic planters who gave rise to a remarkable galaxy of very able men including not only those just named, but Washington, the Lee family and others. It had its manual workers in the form of slaves, and it also had a considerable number of poor whites — people not competent enough to become large landowners, but not willing to compete on equal terms with the Negroes.

In Albemarle County, as in some others, a different situation prevailed, for there was a middle class. This appears in the following quotation — keen, though none too complimentary — from the letters of Major Thomas Andrews, a British prisoner who was kept in restraint, but not confinement, at Charlottesville for a year or more during the Revolutionary War: ¹

¹ Quoted by Edgar Woods in his *History of Albemarle County*, 1901.

“There are three degrees of rank among the inhabitants, exclusive of the negroes. . . . The first class consists of gentlemen of the best families and fortunes, which are more respectable and numerous here than in any other province. For the most part they have had liberal educations, possess a thorough knowledge of the world, with great ease and freedom in their manners and conversation. Many of them keep their carriages, have handsome services of plate, and without exception keep their studs, as well as sets of handsome carriage horses.

“The second class consists of such a strange mixture of character, and of such various descriptions of occupation, being nearly half the inhabitants, that it is difficult to ascertain their exact criterion and leading feature. They are however hospitable, generous and friendly; but for want of a proper knowledge of the world, and a good education, as well as from their continual intercourse with their slaves, over whom they are accustomed to tyrannize, with all their good qualities they are rude, ferocious and haughty, much addicted to gaming and dissipation, particularly horse racing and cock fighting. In short, they form a most unaccountable combination of qualities, directly opposite and contradictory, many having them strangely blended with the best and worst of principles, many possessing elegant accomplishments and savage brutality; and notwithstanding all this inconsistency of character, numbers are valuable members of the community, and very few deficient in intellectual faculties.

“The third class [the Poor Whites apparently], which in general composes the greatest part of mankind, are fewer in Virginia in proportion to the inhabitants, than perhaps in any other country of the world; yet even those who are rude, illiberal and noisy, with a turbulent disposition, are generous, kind and hospitable. We are induced to imagine there is some-

thing peculiar in the climate of Virginia, that should render all classes of so hospitable a disposition. The lower people possess that impertinent curiosity so disagreeable to strangers, but in no degree equal to the inhabitants of New England. They are averse to labor, much addicted to liquor, and when intoxicated extremely savage and revengeful. Their amusements are the same with those of the middling sort, with the addition of boxing matches."

In Albemarle County the middle class described by their prisoner and enemy was much more numerous than in most parts of Virginia east of the Blue Ridge. It consisted largely of Scotch-Irish who came by way of Pennsylvania, migrated southwestward down the great Appalachian Valley between the Blue Ridge on the east and the Front of the Allegheny Plateau on the west. They were in Albemarle because when they found the low gap in the Blue Ridge near Charlottesville, they spilled southward, back toward the seacoast. Some of them held as much land as the aristocrats who had moved up from Tidewater Virginia; land holdings of a thousand to twenty thousand acres were by no means uncommon in either group.

The way in which the Scotch-Irish supplemented and strengthened the Virginians can best be made clear by repeating the essence of what John Fiske has said about them in his *Old Virginia and Her Neighbors*. Their migration to America was "an event of scarcely less importance than the exodus of English Puritans to New England and that of English cavaliers to Virginia." During the four decades after 1611 about three hundred thousand Scotch migrated to the Irish province of Ulster because James I wanted a Protestant population that would outnumber the Catholics. The settlers were picked men and women of the most excellent sort. Although Ulster had previously been little more than a wilderness of bogs and fens, they transformed it into a garden, and into a notable center for

the manufacture of woollens and linens. By the beginning of the eighteenth century they numbered nearly a million, not peasants, but intelligent yeomanry and artisans. In 1718 when a miscellaneous group of 319 men signed a document, no less than 306 wrote their names in full, a record almost no other part of the British Empire, perhaps not even New England, could have rivalled.

The prosperity of the selected Scotch immigrants in Ulster aroused the jealousy not only of rival manufacturers in England, but of the English church which looked askance upon Presbyterians. About 1700 this resulted in legislation which seriously damaged the Irish linen and woollen industries and threw many workmen out of employment. It also led to laws forbidding the Presbyterians to keep schools, perform marriage ceremonies, or hold any office higher than that of petty constable, and so on through a long list of silly and outrageous enactments. For a few years this tyranny was endured, but by 1719 the hope of improvement had worn away. So from that year, until the passage of the Toleration Act for Ireland in 1782, the people of Ulster kept flocking to America — still another selective migration.

Of all the migrations to America previous to the days of steamships, this was by far the largest in volume, for it probably comprised at least half a million people. With their descendants they formed not less than one-sixth of our population at the time of the Revolution. The majority went to Pennsylvania and many settled in the Allegheny region. Thence they spread rapidly and in large numbers toward the southwest along the mountain country through the Shenandoah Valley and then into Virginia and the Carolinas. When they first came into Virginia, about 1730, Governor Gooch was dispensing the frontier lands so freely and indiscriminately that one Jacob Stover, it is said, secured many acres by giving his cattle

human names as settlers; and a young woman, by dressing in various masculine disguises, obtained several large farms.

These Scotch, with a slight veneer of Ireland, soon began to work profound modifications in the life of Old Virginia. Hitherto it has been purely English and predominantly Episcopal, Cavalier and aristocratic. There was now a rapid invasion of Scotch Presbyterianism, with small farms, few slaves, and democratic ideas, made more democratic by life in the backwoods. In the course of two generations the bloodless but stubborn conflict between these two social groups, so different in habits and ideas, resulted in the separation of church and state, complete religious toleration, the abolition of primogeniture and entails, and many other important changes, most of which were consummated under the leadership of Thomas Jefferson between 1776 and 1785.

Albemarle was one of the counties where the fusion of English and Scotch ideals was most complete. The character of society there arose from the fact that between the aristocracy represented by Jefferson and Monroe, and the submissive poor whites, there was injected a strong, sturdy, self-reliant, religious middle class with leaders like Andrew Jackson, Daniel Boone, Anthony Wayne, and the Lewis and Clark whose explorations ultimately made it possible for the United States to secure the great states of our northwest. Among these men Lewis was a citizen of Albemarle county, while the parents of Clark lived there, but moved away before he was born.

The secret of the contrast between Buckingham and Albemarle counties now seems clear. Buckingham has lost in the race because it is sidetracked south of the James River in a sort of enclave through which no regular railroad or main highway yet passes even in our day. Therefore in spite of a boom early in the nineteenth century, it has suffered an adverse migration which has finally weeded out practically all

the people who are able to lead and to maintain progress. Albemarle, merely by virtue of lying north of the James River, and possibly because of its physical beauty, and its position on a main line of traffic to the west, received an unusually good quota of able Virginia aristocrats. Then, by reason of the gap in the Blue Ridge, it received also just the element that it needed in the form of a sturdy middle class of high quality, selected and tempered by successive migrations from Scotland to Ireland, from Ireland to the New World, and again from Pennsylvania to Virginia. Because the union of these two groups created such wholesome and attractive social conditions, because they founded many churches and schools, an academy, a university, an agricultural society, a Bible Society and the like, and also because their county is physically beautiful, it became a place that attracted, and still attracts other able people who would never entertain the thought of settling in Buckingham.

That brings us to the end of our story. In a case like this the ultimate difference in the fate of two adjacent regions is out of all proportion to the geographical differences that originally entailed that fate. The reason is that geographic conditions act not only directly but indirectly. Their direct effect in the present case was merely to make it a little more expensive to ship tobacco and wheat out of Buckingham County than out of Albemarle, and to make it easy for people to get to Albemarle county from the northwest. But those small differences, combined perhaps with certain other minor geographic conditions such as the scenery, so loaded the dice that people of the more able type moved away from Buckingham County but were attracted to Albemarle. Thus there arose a concentration of people of relatively low ability in the county south of the James River and a concentration of highly able people in the county to the north.

Such concentrations are of almost incalculable importance. They often give rise to slums in the parts of a city where the land is low and level near the water front, along the river bank, or around the freight yards. Where the western or northern hills are high, but not too high, so that the houses are lifted above the city and the prevailing northwest winds can blow without first loading themselves with the dust of factories, the concentration takes the form of an exclusive residential district where only a few of the children have intelligence quotients below one hundred. On a larger scale similar concentrations occur in backward highlands versus progressive lowlands. Berea College aims above all things to elevate the mountain people of Kentucky and Tennessee, but it is located on the edge of the fertile lowland because there it is accessible. That it accomplishes much of its purpose cannot be doubted. Yet little by little it adds to the conditions which it strives to alleviate. According to its carefully compiled records, among its graduates with bachelor's degrees who have been out of college long enough to be established in their life work, less than four-fifths of the men who came from the mountains, and only three-fifths of the women, have gone back there. Practically none from other regions go to the mountains permanently. Moreover, even among the mountaineers who go back to the mountains the great majority do not settle in the old regions, but in the county seats and mining towns. Hundreds of other places where transportation is difficult are being drained of their most energetic and able people in this same way, just as has happened in Buckingham County. In the long run such occurrences and the corresponding concentration of the abler people in cities where they gradually tend to die out, may prove to be by far the greatest of all the results of differences in transportation.

Here we must bring this volume to a close, leaving hundreds

of important geographic truths untold. But whether we deal with climate, soil, relief or any other geographic factor, the fundamental principles are the same. Aside from the direct physiological stimulus of climate, geographic conditions are passive. They do not say that we must do this or that. The choice lies with ourselves. The physical environment merely says that if we do certain things we will prosper, increase, and be able to take new steps of progress. If we do others, difficulty, danger, and even extermination will be our lot. Nature makes no announcement of her decrees; she simply carries them out.

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